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FOREST FLORA

OF THE

SCHOOL CIRCLE, N.-W. P.,

BEING

DESCRIPTIVE LIST OF THE INDIGENOUS WOODY PLANTS OF THE
SAHARANPUR AND DEHRA DÚN DISTRICTS AND THE ADJOIN-
ING PORTIONS OF THE TEHRI-GARHWAL STATE
IN THE NORTH-WESTERN PROVINCES,

WITH

ANALYSES,

COMPILED FOR THE USE OF THE

STUDENTS OF THE IMPERIAL FOREST SCHOOL
DEHRA DÚN,

BY

UPENDRANATH KANJILAL,

EXTRA-ASSISTANT CONSERVATOR OF FORESTS.



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INTRODUCTION.

THIS work is due to the necessity, which has made itself much felt of late, of having a simple Flora for the use of the students of the Imperial Forest School to assist them in identifying the trees and shrubs, etc., which they meet with when engaged on excursions and on practical work in the forests of the School Circle of the North-Western Provinces, which are their training ground. Had it been possible to provide a new and cheaper edition of the splendid "Forest Flora of North-West and Central India," by Sir D. BRANDIS, K.C.I.E., F.R.S., this work might not have been required, but circumstances have prevented the issue of that new edition, and a Forest Flora of our own became a necessity. It was with very great pleasure that I was able to advise an old Dehra Dún student and a native of India to undertake a task which he was really the first fully to represent to me as urgently wanted for students' use. He was at first very diffident about it, but, on my urging him to take it up, he agreed to try and carry it out. He has worked very hard at it, in the intervals of the arduous duties of instruction of the Lower or Vernacular Class at the School, and I have every hope that the results of his labours will prove satisfactory and that his Flora will be useful, not only to the students who are qualifying for the provincial service,



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but to all officers of either service whose work lies in the School Circle and the Circles adjoining.

I believe this to be the first botanical work of any importance which has ever been prepared by a native of India, and the Imperial Forest School may well be proud of having educated at least one native gentleman who has taken up Botany as a study, and botanical work as a labour of love.

The book does not, of course, pretend to be original : it is based upon the "Flora of British India," the monumental work which we owe to the indefatigable labour of Sir JOSEPH HOOKER, G.C.S.I., etc., and which took from 1872 to 1898 to complete, and which, as its author distinctly says in his "Preface," was intended "to facilitate the compilation of local Indian Floras." Babu UPENDRANATH has also had before him the clear and accurate descriptions and the lucid analyses of the "Forest Flora of North-West and Central India" already referred to, and he has been able to consult many other books and writings of importance in the Library of the Forest School. This alone, however, would not have sufficed : it was necessary to examine, dissect and describe the plants themselves, either living as they were met with in the forests, or dried and preserved in the Herbarium at Dehra Dún, which contains now an excellent collection of specimens of the plants of India, and more especially of the trees, shrubs, climbers and herbs of economic forest value.



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The real test of the value of Babu UPENDRANATH'S work will be afforded by the experience of some years' use of it in the field. That I myself shall be unable to use it and test it in that way, I must regret; but I am confident that the test of experience will be a successful one, and that this Flora will prove valuable to many successive classes of Forest students and many successive Forest officers, whose duties may call them to the beautiful forests of the Dún and the splendid scenery of the adjoining Himalayan Mountains.

Besides such help as I have been able to give him myself, Babu UPENDRANATH has had great assistance from Mr. J. F. DUTHIE, B.A., F.L.S., the present Director of the Botanical Department of Northern India, who has now, during the whole of the twenty years since the Imperial Forest School was founded, taught Systematic Botany to successive classes, both in the lecture room and in the field. Among other officers whose work, either in the way of published writings, list of plants, etc., or of collecting specimens for the School Herbarium, has contributed to the present Flora, may especially be mentioned Messrs. A. SMYTHIES, N. HEARLE, and Pandit KESHAVÁNAND, all of them at one time or another connected with the School.

The area taken up in the Flora is the area of the School Circle Conservatorship; *i.e.*, the district of Saháranpur, especially the Siwalik portion; the district of Dehra Dún, including the hills of Málkôt and Mussoorie



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and the parganas of Jaunsar-Bawar ; the portion of the State of Tehri-Garhwal in the valley of the Upper Tons and its tributaries, the Pábar and Rupin, the forests of which are leased by Government for purposes of Forest Conservancy ; and the similar leased forests in the territories of the Thakurs of Raiengarh and Dádi of the Simla Hill States. In elevation, this area passes from only a few hundred feet above the sea at Saháranpur, to the extreme limit of vegetation in the Himalayas ; it is consequently not entirely a correct geographical field, but a field of study whose limits are fixed by the same political reasons that fix the area controlled by the Conservator of the School Circle.

It has not been considered necessary to enter at length into synonymy in this work. Those who desire to do so can always consult the "Flora of British India" which has invariably been quoted. Nor has it been thought advisable usually to give vernacular names from regions outside the School Circle area ; or to quote uses and information, unless they are likely to be useful in that area.

The work has run to rather a greater length than was at first contemplated ; but it is hoped that this will prove rather an advantage than a drawback.

J. S. GAMBLE,

*Conservator of Forests, School Circle,
N.-W. P. and Oudh, and Director
of the Imperial Forest School,
Dehra Dún.*

DEHERA DÚN ;
4th February 1899.



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COMPILER'S PREFACE.

ALTHOUGH in the Introduction which he has so kindly written for me, Mr. GAMBLE has explained the circumstances under which this book came to be written, he has said nothing about its general plan and the way in which it is intended to be used, and I think it best, therefore, to add a few further words in explanation.

The chief object has been to render the work of any one consulting the book as easy as possible, by giving him analyses based on the most obvious characters of the Orders, the Genera and the Species. To those who are fairly good botanists, the Order and perhaps the Genus will suggest themselves at once, and so the key to the Species will alone come into use; sometimes the Order will be known but not the Genus, and then recourse will be had to the Generic key, to be followed, when the Genus is ascertained, by that to the Species; often the Order itself will not be known, and then the searcher must look in the analyses of Orders; and finally there may be cases where the Division, or even the Section, of the Vegetable Kingdom is not apparent, and he will have to begin from the very beginning of all.



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In using the keys, the student should bear in mind that identification is arrived at by a continued process of elimination. Thus he should first of all determine, from the key given in page 1, the Section and the Division of the Vegetable Kingdom under which the plant he wants to identify is likely to come. This primary division, it will be seen, is based exclusively on the characters of the flowers; leaf and fruit characters do not enter into it. Next follow the analyses of the great Divisions into Natural Orders. It will become evident at this stage how important it is to have a specimen complete with leaves, flowers, and fruit,—for all these characters have been employed in drawing up these and subsequent keys. To facilitate reference, the Natural Orders have been numbered consecutively all through, and the numbers and names have been repeated at the top of each page in the body of the Flora. The key to the Natural Orders was the one the most difficult to prepare, and I am fully conscious that it may have defects; but I can only hope they are few.

Having arrived at the Natural Order that seems the most likely, the student should at once turn to its description in the proper place, and compare the charac-



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ters given there with those of his specimen ; for the characters given in the keys usually occur with considerable variation, or are difficult of determination, and are therefore not always quite a safe guide.

When fully satisfied as to the Natural Order, the student should proceed to the Genus, and last of all, to the Species, in exactly the same way as above, *viz.*, first by the keys and then by comparing his plant with the descriptions. Generic characters have not, however, been separately given in the case of such Genera as have only one Species.

In describing characters, the same sequence has been followed throughout the book. Adhering to the same principle, the several items in the description of the leaves—the most obvious of all organs for the purpose of identification—have been given, as much as possible, in a definite order. This indeed can be claimed as a special feature of the book, and it may not be out of place to state it here:—1. *Disposition*, *i.e.*, opposite, alternate, or whorled.—2. *Form*, *i.e.*, simple or compound.—3. *Dimensions* of the blade only.—4. *Shape*, including the termination.—5. *Margins* whether entire, wavy or cut in any way.—6. *Consistence*, *i.e.*, whether membranous or coriaceous, tough, fleshy, soft or hard.—7. The *Surfaces*,



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including their indumentum.—8. *Venation*.—9. The *Base*,—any peculiarity regarding it not brought out in item 4.—10. The *Petiole*, its length, etc.—11. The *Stipules*, if present. In the case of compound leaves, the leaflets have been described separately, generally beginning with item 3 if the leaf is digitate, or only omitting item 2 if it is pinnate. The advantages of such an arrangement are too obvious to require any further remark.

The descriptions of leaves are followed by those of the inflorescences, flowers and fruits. Sometimes it may happen that either flower or fruit is missing, and then the work will be more difficult, but a little thought may often lead the searcher into the right track, and he may be enabled to make, at any rate, a shrewd guess at his plant. To those, who, like the officers and students at or near Dehra, have the opportunity of doing so, it is strongly to be recommended that having arrived at what they conceive to be their plant, they should take an early opportunity of making sure by comparing their specimens with the named sheets in the collection. To facilitate this, the numbers of Natural Orders and Genera have invariably been quoted from HOOKER & BENTHAM'S "Genera Plantarum," and the Species



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under each Genus have been arranged in the sequence in which they occur in the "Flora of British India."

A glossary of Botanical Terms has been added, in the preparation of which I have been greatly helped by the lately published Glossary of Mr. R. L. HEINIG, from which useful book some of the definitions have been taken *verbatim*,—and also by Mr. A. F. GRADON, the Botany Instructor at Dehra Dún, who has kindly examined and verified my draft.

It seems proper to mention that a few plants have been included that are not exactly woody, and also a few that are, properly speaking, not indigenous, although successfully cultivated in the School Circle. In either case, their economic value or botanical importance, or both, have been considered sufficient to warrant this deviation.

I hope I may be allowed to add here my own acknowledgments for the encouragement they have given me, to the Inspectors General of Forests, Mr. B. RIBBENTROP, C.I.E., and Mr. H. C. HILL, and to the Directors of the Imperial Forest School under whom I have served,—Mr. H. C. HILL, Mr. J. W. OLIVER, and more especially to Mr. J. S. GAMBLE, M.A., F.R.S., C.I.E., as it was during his tenure of office, and under



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his guidance, that the first draft was completed. But for his constant encouragement and ever ready help, I might have been content with a much smaller effort. My thanks are also due to Mr. DUTHIE, who, as my Instructor in Systematic Botany, has always evinced a special interest in my undertaking. I am also greatly obliged to Pandit KESHAVÁNAND, now Conservator of Forests in the Tehri-Garhwal State, for considerable help in supplementing and verifying the vernacular names collected by Messrs. HEARLE, SMYTHIES, FERNANDEZ and others. Not being myself an inhabitant of the North-Western Provinces, some such help was much wanted, and I could not have found it in any one better than in my friend Pandit KESHAVÁNAND.

I am fully conscious of many defects, and that, in spite of my best endeavours, many errors,—technical, literary and typographical,—must have crept in. If those, who may use this book, will kindly inform me of them from time to time, with a view to their correction in any subsequent edition, they will lay me under a great obligation.

UPENDRANATH KANJILAL,
Extra-Assistant Conservator of Forests.

DEHRA DÚN;
March 26, 1900.

GLOSSARY

OF THE

BOTANICAL TERMS

USED IN THE TEXT.



- Accrescent**, increasing in size with age; usually said of parts of the calyx or corolla that persist and enlarge after flowering.
- Achene**, a small dry indehiscent 1-celled 1-seeded fruit, or a 1-seeded carpel of an apocarpous fruit.
- Acicular**, *needle-shaped*; long and slender.
- Acorn**, fruit of the oak, *i.e.*, a nut enclosed within a cup formed of an involucre of thickened bracts.
- Acumen**, a sharp tapering point more or less prolonged. **Acuminate**, terminating in an *acumen*.
- Acute**, evenly tapering and ending in a narrow angle, but without a prolongation.
- Adnate**, said of dissimilar organs when congenitally united.
- Adventitious**, occurring in an unusual position.
- Estivation**, the mode in which the parts of a flower are folded in the bud; also their relative position.
- Albumen**, the nutritive substance found within the seed-coats of some seeds and outside the embryo.
- Amplexicaul**, said of a sessile leaf or the base of a petiole when *clasping the stem*.
- Anastomosing**, reticulately united.
- Anatropous**, said of an inverted ovule, *i.e.*, one with the foramen close to the hilum, and the chalaza at the opposite end, the axis of the ovule itself remaining straight.
- Androgynous**, said of an inflorescence bearing both male and female flowers.
- Annulate**, marked transversely by *rings*.
- Anther**, the part of a stamen that bears the pollen.
- Apiculate**, with a short pointed tip.
- Apocarpous**, with the carpels free and distinct.
- Arcuate**, shaped like a *bow*, *i.e.*, moderately curved.
- Aril**, arillus, an accessory seed-covering or an appendage growing from or about the hilum of a seed.
- Arillate**, having an *aril*. **Aril-lode**, a false *aril*.
- Arista**, an *awn* or bristle. **Aristate**, bearing or terminating in an *arista*.



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Articulate, jointed in such a manner as to separate at maturity.

Ascending, directed obliquely upward.

Auriculate, having a flat lateral expansion like the lobe of the ear.

Awn, a bristle-like appendage, especially of the glumes of grasses.

Axil, the upper angle formed by a leaf or a similar organ and the supporting stem or axis. **Axillary**, in or relating to the axil.

Axile, relating to the axis, generally said of a kind of placentation in which the ovules are borne on the central axis of the ovary.

Baccate, berry-like, pulpy.

Basifixed, fixed by the base, especially said of an anther attached at its lower end to the top of the filament.

Bast, fibrous inner bark.

Berry, a simple fruit succulent throughout, without a stone, and generally with more than one seed.

Bifarious, in two opposite vertical rows.

Bifid, divided into two segments to about the middle with a narrow sinus.

Bilabiate, having two lips.

Bipartite, divided into two segments almost to the base.

Bipinnate, twice pinnate.

Biseriate, in two series or rows, generally one above or within the other.

Bisexual, having both stamens and pistil in the same flower; **hermaphrodite**.

Biternate, twice ternate.

Bract, a rudimentary or modified leaf subtending a flower or an in-

florescence. **Bracteate**, having bracts.

Bracteole, a secondary bract or one of the ultimate grade subtending each flower of an inflorescence. **Bracteolate**, having bracteoles.

Bulb, a short stem, more or less conical above and flattened underneath, and usually underground, which bears a bud or buds concealed in fleshy scales or coats. **Bulbiform**, formed like a bulb.

Buttressed, said of stems with vertical projections, e.g., the stems of Semal, Sundri, etc.

Caducous, falling off very early.

Cæspitose, tufted or growing in tufts, e.g., many species of bamboos.

Callus, the new tissue which forms over the wounds of plants.

Calyx, the outer whorl of floral leaves, immediately below or outside the corolla. **Calycine**, belonging to the calyx.

Calyptra, a cap, hood or veil.

Cambium, a zone of tender thin-walled cells separating the wood from the bark in Dicotyledons, by the division and growth of which new cells are formed.

Campanulate, bell-shaped, deeper than cup-shaped.

Canescent, with very short, grey hairs or pubescence giving the epidermis a greyish-white hue.

Capitate, having a globose head.

Capsule, a dry syncarpous fruit the carpels of which open at maturity.

Cartilaginous, firm and tough like parchment.

Caryopsis, a grain; the seed-like fruit of Gramineæ with thin



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Pericarp, which is usually adnate to the contained seed.

Catkin, a scaly spike (or raceme ?) of unisexual flowers, pendulous or drooping, and generally deciduous.

Caudate, furnished with a *tail*, or with a slender *tail*-like terminal appendage.

Chalaza, that part of the ovule where the base of the nucleus is confluent with the coats.

Chartaceous, having the texture of writing *paper*; thin and flexible.

Ciliate, fringed with thick marginal hairs like the *eyelashes*.

Cirrrose, bearing *tendrils*.

Cladode, a branch, more or less flattened which assumes the form and function of a leaf.

Clavate, *club*-shaped; slender below and gradually thickened upward.

Cocci, pl. of *coccus*, the seed-like and generally 1-seeded lobes of a syncarpous ovary which become more or less dry, and separate at maturity.

Cogener, one of the *same genus*.

Coma, a tuft of soft hairs or cotton borne on a seed. **Comose**, having a *coma*.

Concolor, of the same colour throughout.

Conduplicate, folded once upon itself lengthwise.

Cone, the multiple fruit of conifers formed mostly of imbricated scales by which the seeds are subtended.

Connate, said of similar organs or parts of the same organ when congenitally united.

Connective, the portion of a stamen that *connects* the two lobes or cells of an anther.

Connivent, *conniving*, said of sepals, petals or anthers having the apex arching over or converging in the centre of the flower.

Contorted, *convolute*, said of leaves or petals with one margin within, and the other margin without, the whorl.

Cordate, *heart-shaped*, i.e., with the base shaped like the figure of a *heart* on cards.

Coriaceous, *leathery*; tough and thick.

Corm, a solid fleshy underground stem more or less jointed, and naked or within thin scales, such as is characteristic of certain families, e.g., Aroideæ.

Corolla, the inner whorl of floral leaves.

Corona, a *crown*; the *crown*-like process from the inner face of petals or the throat of a corolla, or from stamens.

Corymb, an inflorescence of the indefinite or centripetal kind in which the branches or pedicels, although starting from different points, all attain almost the same level.

Cotyledons, the seed-lobes or first leaves of an embryo.

Crenate, with rounded teeth.

Cruciform, in the form of a *cross*; generally said of flowers with four petals arranged crosswise.

Crustaceous, hard and brittle; said of a covering which splits, and breaks off easily.

Culm, the hollow and jointed stem of grasses, especially of bamboos.

Cuneate, *wedge-shaped* acute-angled at the base.

Cupula, *cupule*, a *cup*-like involucre of thickened bracts supporting the nut of the oak.



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- Cupular**, belonging to, or shaped like, the involucre-cup.
- Cusp**, a long and tapering rigid point. **Cuspidate**, furnished with a *cusp*.
- Cuticle**, the outermost layer of the epidermis.
- Cyme**, an inflorescence of the definite or centrifugal type.
- Decandrous**, with *ten stamens*.
- Declinate**, bent to one side.
- Decomound**, several times compound or divided.
- Decurrent**, *running down* into; said of a sessile leaf when the blade is prolonged below the insertion and so *runs down* the stem.
- Decussate**, in pairs alternately crossing at right angles.
- Dehiscence**, the mode of opening of a capsule or an anther.
- Deltoid**, triangular in outline or in section like the Greek letter Δ .
- Dentate**, with margin cut into triangular salient teeth directed outward. **Denticulate**, minutely toothed.
- Diadelphous**, said of *stamens* united by their filaments into *two sets* or bundles.
- Dichotomous**, forked in pairs.
- Didynamous**, said of a flower with two long and two short stamens.
- Digitate**, *finger-like*; said of a compound leaf with the leaflets all borne on the apex of the common petiole.
- Dimorphic**, **dimorphous**, said of hermaphrodite flowers having *two forms*, one with long style and short stamens, the other with short style and long stamens.
- Dioecious**, unisexual with the male and female flowers on separate plants.
- Disk**, a circular enlargement of the receptacle in the form of a cup, or of a cushion. **Discoid**, *disk-like*; circular and flat or depressed in the centre.
- Dissepiment**, a partition in an ovary or pericarp in the direction of its length.
- Distichous**, arranged in *two* opposite vertical *rows*.
- Divaricate**, spreading widely apart.
- Dorsal**, relating to, inserted on, or opening by the *back* or outer suture.
- Drupe**, a stone-fruit, *i.e.*, one with a fleshy or pulpy pericarp and a bony or crustaceous endocarp.
- Ebracteate**, without *bracts*.
- Ebracteolate**, without *bracteoles*.
- Echinate**, set all round with sharp bristles like a *hedge-hog*.
- Elliptic**, elliptical, oblong or oval with rounded ends. **Ellipsoid**, an elliptical solid.
- Emarginate**, with a notch at the apex.
- Embryo**, the rudimentary plantlet formed in a seed.
- Endocarp**, the inner layer of the pericarp.
- Endosperm**, the albumen of a seed.
- Epicalyx**, a whorl of bracts below the *calyx* proper and somewhat resembling it in shape and colour.
- Epicarp**, the outer layer of a pericarp.
- Epidermis**, the outermost layer of tissue or skin of a plant.
- Epigynous**, inserted on the top of the *ovary*.
- Epipetalous**, said of stamens which are borne on, or adnate to, the *petals* or corolla.
- Epiphyllous**, growing on *leaves* or perianths.



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Epiphyte, a plant growing on, but not nourished by, another plant.

Epiphytic, having the habit of an *epiphyte*.

Exalbuminous, without *albumen*.

Excavate, hollowed into broad deep pits.

Exocarp, the external layer of the pericarp.

Extipulate, without *stipules*.

Extrorse, applied to anthers that dehisce towards the circumference of the flower.

Falcate, curved like the blade of a *sickle* or *scythe*.

Farina, *starch*, or any thing resembling it or analogous to it.

Farinaceous, consisting of or resembling *starch*.

Fascicled, fasciculate, in dense clusters.

Ferruginous, coloured like *iron-rust*.

Fibrovascular, said of a tissue consisting of woody fibres and ducts or vessels.

Filament, the stalk of an anther.

Filiform, *thread-like*; long and slender.

Fimbriate, having a *fringe* or border of fine *thread-like* processes.

Floccose, *woolly* with locks of dense soft hairs that are easily detached.

Foliaceous, of the form or texture of a *leaf*.

Follicle, a fruit of a single carpel opening by only one, usually the inner, suture.

Fugacious, falling off or fading very early.

Funicle, the stalk of an ovule or seed.

Fusiform, *Spindle-shaped*; solid and tapering at both ends.

Gamopetalous, having *combined petals*.

Gamophyllous, having a perianth of *united leaves* or segments.

Gamosepalous, having *combined sepals*.

Genus, pl. *genera*, a group of closely related species indicated by the first name of a plant.

Gibbous, having a *pouch-like* swelling or protuberance on one side.

Glabrous, without hairs of any kind. **Glabrate**, somewhat *glabrous*. **Glabrescent**, becoming *glabrous*.

Glands, small *wart-like* bodies or round *excrescences* of any kind found on stems, petioles, etc. or inside flowers. Small raised superficial *dots*, or minute *vesicles* imbedded in the substance of leaves, etc., usually filled with oil.

Glandular, having *glands*, or relating to *glands*.

Glaucous, of a bluish-grey colour, often covered with a fine bloom.

Glumes, the chaffy bract-like *scales* of the inflorescence of Grasses and their allies. **Glumaceous**, resembling or relating to *glumes*.

Gynobase, a short and broad elongation of the torus on which the pistil rests. **Gynobasic**, resting on a *gynobase*.

Gynophore, the stipe or stalk supporting an *ovary*.

Haustorium, pl. *Haustoria*, a sucker-like root by means of which a flowering parasite draws nourishment from its host.

Head, a form of inflorescence consisting of a more or less dense cluster of sessile flowers which are centripetal in evolution.



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Hermaphrodite, bisexual; having both stamens and pistil in the same flower.

Heterogamous, said of flower-heads when male, female, bisexual and neuter florets, or any two or three of these, are borne on the same head.

Hilum, the place of attachment of an ovule or seed to the placenta or funicle.

Hirsute, thickly covered with long and rather coarse hairs.

Hispid, beset with rigid or bristly hairs.

Homogamous, said of a flower-head with the florets all of the same sex.

Hyaline, transparent or translucent and colourless.

Hypocrateriform, *salver-shaped*; said of a corolla with a slender tube abruptly expanded into a flat horizontal limb.

Hypogynous, inserted *below* the ovary.

Imbricate, overlapping so as to break joints like *tiles* on a roof.

Imparipinnate, *unequally pinnate*; pinnate with a terminal leaflet or pinna.

Incomplete, said of a flower wanting calyx or corolla or both.

Induplicate-valvate, said of members of a whorl when they touch one another with the margins of each folded inward.

Inferior, inserted below the ovary and free from it, if said of the calyx; adnate to, or situated below, the calyx, if said of the ovary.

Inflorescence, the mode in which flowers are arranged on the stem. Also used as a collective term for the whole flowering portion of the

stem of a plant with its branches bracts and flowers.

Interpetiolar, said of stipules of opposite leaves and inflorescences when they are inserted *between the petioles*, i.e., across the stem.

Intrapetiolar is applied to stipules of single leaves when they are connate by their margins so as to form apparently one stipule.

Introrse, applied to anthers that dehisce towards the pistil.

Intruded, projecting inward.

Involucre, a circle of bracts subtending a flower-cluster.

Involute, *rolled* inward.

Irregular, wanting in symmetry of form, said of flowers with the petals or perianth-segments unequal in size and shape.

Keel, the central dorsal ridge like the prow of a boat, formed by the two anterior and innermost petals of a papilionaceous corolla.

Kernel, the contents of the putamen of a drupe.

Labiate, *two-lipped*.

Laciniate, irregularly cut or fringed into narrow lobes or segments with narrow sinuses.

Lanceolate, shaped like a *lance-head*, i.e., 2-4 times as long as broad, narrowed at both ends, especially towards the apex, and broadest below the middle.

Legume, a fruit of a single carpel usually opening by both sutures when ripe. See *pod*.

Lenticel, a *lentic*-shaped corky process developed on the bark of some trees. **Lenticellate**, having *lenticels*.

Lenticular, *lentic*-shaped; like a double-convex *lens*.

Ligule, anything shaped like a *strap*, such as the limb of the



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- ray-corolla** in some *Compositæ*.
The thin and scarious projection from the summit of the sheath of the leaf of grasses. **Ligulate**, *strap-shaped*, usually applied to the ray-flowers of *Compositæ*.
Linear, narrower than lanceolate, —at least five times as long as broad.
Lobulate, divided into *small lobes*.
Loculicidal, applied to a kind of dehiscence in which the splitting takes place through the *cells*.
Lodicule, one of the small scales which represent the perianth in the flower of a grass, occurring usually in pairs.
Lyrate, pinnately lobed with a large terminal lobe and one or more pairs of small basal lobes, so as to resemble a *lyre*.
Mammillate, having *nipple-like* prominences.
Medullary rays, vertical plates of cellular tissue which radiate from the centre of a dicotyledonous plant towards the cambium.
Mesocarp, the *middle* layer of the pericarp.
Micropyle, the minute orifice of an ovule, which is represented by a mark on its outer coat when it becomes a seed.
Monadelphous, said of stamens united by their filaments into *one set*, forming a tube or column or sheath.
Moniliform, cylindrical and constricted at regular intervals so as to resemble a *necklace* of beads.
Monœcious, unisexual with the male and female flowers on the same plant.
Mucronate, abruptly terminating in a short straight stiff and sharp *point*.

- Multifarious**, in *many* vertical rows.
Multifid, cleft into *many* lobes or segments.
Multiseriate, in *many series* or rows.
Needles, the acicular leaves of conifers.
Nerves, the principal lateral ribs of a leaf. **Nervose**, with nerves strongly developed.
Nut, a hard indehiscent 1-seeded fruit resulting from a syncarpous ovary.
Obconic, inversely *conical*, *i.e.*, with the attachment at the pointed end.
Obcordate, inversely *cordate*, *i.e.*, broadly two-lobed with a notch at the apex.
Ob lanceolate, inversely *lanceolate*, *i.e.*, long, narrow and tapering at both ends, but broadest above the middle.
Oblong, much longer than broad with the sides nearly parallel.
Obovate, inversely *ovate*, *i.e.*, egg-shaped in outline with the broad end towards the apex. **Obovoid** said of a solid which is inversely egg-shaped.
Obsolete, rudimentary, imperfectly developed.
Operculum, a lid; a top which separates by a transverse line of separation.
Orbicular, orbiculate, flat with the outline circular or nearly so.
Order, a group of co-related genera.
Ovate, *egg-shaped* in outline with the broad end towards the base.
Ovoid, said of a solid with an



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ovate or oval longitudinal section.

Palea, the innermost glume of the flower of a grass, or the chaffy scales on the receptacles of many Compositæ. **Paleaceous**, *chaff*-like.

Palmate, with the midribs of the lobes or leaflets all radiating from the apex of the petiole. **Palmatilobed**, *palmately lobed*. **Palminerved**, with nerves radiating like the ribs of a palmate leaf. **Palmatipartite**, with segments palmately separated almost to the base.

Pandurate, *fiddle-shaped*.

Panicle, an inflorescence in which the axis is divided into branches bearing two or more flowers; a compound raceme or compound irregular corymb.

Papilionaceous, *butterfly-like*; applied to the kind of corolla characteristic of the Pea tribe of Leguminosæ; like the flower of the Pea tribe. See **Keel**, **Wings** and **Standard**.

Papillose, bearing minute *nipple*-shaped projections.

Pappus, thistle-down; the hairy tufts on achenes and fruits.

Parasite, a plant that grows on or in another plant, and draws nourishment from it.

Parietal, attached to the inner wall of an ovary.

Paripinnate, *syn. abruptly pinnate*, *evenly pinnate*; pinnate without the terminal leaflet or pinna.

Patent, widely spreading.

Pedate, like a bird's *foot*; palmately divided with the lateral divisions 2-cleft.

Pedice, the ultimate stalk sup-

porting a single flower in an inflorescence. **Pedice** late, having a *pedicel*.

Peduncle, the stalk supporting a solitary flower or fruit or a cluster of flowers or fruits. **Pedunculate**, having a *peduncle*.

Peltate, *target-shaped*; said of a flat body, generally a leaf or a stigma, attached to the stalk by the lower surface.

Penninerved, *pinnately nerved*; with nerves spreading laterally from various points on the midrib.

Pentafid, divided into *five* parts with broad notches extending from the margin to about half-way towards the common axis.

Pentamerous, *5*; the members in each whorl of the flower in *fives*.

Penultimate, next to the *ultimate*.

Perianth, a floral envelope; a term especially used when the calyx and corolla are similar in form and texture, or are represented by a single whorl.

Pericarp, the portion of the fruit formed of the ovary and whatever adheres to it, exclusive of, and outside, the seeds.

Petal, one of the parts or leaves of the corolla, whether free or combined. **Petaloid**, resembling or having *petals*.

Perigynous, inserted around and away from the ovary.

Petiole, the stalk of a leaf.

Petiolate, having a *petiole*.

Petiolule, the stalk of a leaflet.

Petiolulate, having a *petiolule*.

Phloëm, the soft tissue of the inner bark which is formed by the outer portion of a vascular bundle.



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Pilose, thinly sprinkled with long soft simple hairs.

Pinna, pl. *pinnae*, the primary division of a bipinnate or tripinnate leaf. **Pinnule**, the secondary division of a tripinnate leaf.

Pinnate, a compound leaf is so called when the leaflets are arranged on either side of a common axis.

Pinnatisect, *pinnately cut* nearly to the common axis.

Pistil, the female organ of a flower consisting normally of ovary style and stigma. **Pistillode**, a rudimentary or barren pistil.

Placenta, that portion of the interior of an ovary on which the ovules are borne.

Plaited, *plicate*, folded in longitudinal *plaits*.

Plumose, *feathered*; said of bristles having fine hairs on either side like the *plume* of a feather.

Pod, the same as **Legume**, but has a wider application, being used to denote any dry dehiscent many-seeded fruit, especially when it is longer than broad.

Pollen, minute *powder*-like grains contained in the anther-cells—the fertilizing agent of a plant.

Polyadelphous, having the stamens united by the filaments into *many sets* or bundles.

Polygamous, with hermaphrodite and unisexual flowers on one or different plants.

Pome, a succulent fruit with many cartilaginous dry cells, *e.g.* the apple and the pear.

Prickle, a sharply-pointed stiff outgrowth of the epidermis.

Pruinose, covered with a *hoarfrost*-like bloom or powder.

Pubescent, covered with short soft straight simple *hairs*.

Puberulous, *puberulent*, minutely *pubescent*.

Punctate, dotted with small *punctures* or glands. **Punctulate**, minutely *punctate*.

Pungent, terminating gradually in a hard sharp point.

Pustular, with small *blister*-like elevations.

Putamen, the shell of a nut; the hard endocarp of a drupe.

Pyrene, one of the small stones of a drupaceous fruit having more than one stone.

Pyriform, *pear-shaped*; obovoid with a tapering base.

Quadrangular, *four-cornered*.

Raceme, an inflorescence of the indefinite kind in which the flowers are borne on pedicels of more or less the same length along a single undivided axis or rachis.

Rachis, the principal axis of a pinnate leaf or of an inflorescence. **Rachillum**, pl. *rachilla*, the secondary rachis of a compound spike; the rachis of a spikelet of grass.

Radicle, the axis of an embryo below the cotyledons.

Raphides, needle-shaped crystals found in the cells of some plants.

Ray, one of the radiating branches of an umbel. **Ray-flowers**, the marginal ligulate flowers of a head or circular flower-cluster.

Receptacle, the torus of a flower; hence also what is commonly known as the *fruit* of figs.

Regular, symmetrical; said of flowers with the petals or perianth-segments alike in size and shape.

Reniform, *kidney-shaped*; i.e., broader than long, broadly cordate at the base, and with the auricles rounded.

Repand, having a wavy margin.

Reticulate, having the veins connected together like the meshes of a net.

Retuse, with a small shallow notch in a rounded or truncate apex.

Evolute, having the margins or apex rolled backward upon the undersurface.

Rhizome, an underground or prostrate jointed stem which sends off roots at the nodes and bears, like a true stem, buds, leaves, or scales.

Rhomboid, *rhomboidal*, with four sides more or less equal, and the lateral angles obtuse.

Rostrate, *beaked*; narrowed into a slender tip or process.

Rotate, *wheel-shaped*; said of a regular gamopetalous corolla with a short tube and a flat spreading limb.

Rotundate, circular or nearly so in outline.

Rugose, full of wrinkles.

Rugulose, minutely wrinkled.

Ruminate, mottled; marked by transverse lines or divisions.

Sagittate, shaped like an arrow-head; tapering towards the apex, cordate at the base, with the lobes pointed and directed downwards.

Samara, an indehiscent dry winged fruit.

Sarmentose, producing long straggling woody branches.

Scabrous, rough to the touch owing to short stiff hairs. **Scaberulous**, somewhat *scabrous*.

Scape, a leafless and generally

unbranched flower-stem rising from the ground.

Scarious, *scariose*, thin, dry, membranous, somewhat stiff and not green.

Scorpioid, said of a form of unilateral inflorescence which is coiled inward from the apex in the bud like the tail of a scorpion.

Sepal, one of the parts or leaves of the calyx, especially when not combined.

Septicidal, dehiscing through the dissepiments or lines of junction.

Septifragal, opening by the valves breaking away from the dissepiments.

Septum, pl. **Septa**, see **Dissepiment**. **Septate**, divided by one or more partitions.

Serrate, toothed like a saw with the teeth directed forward.

Serrulate, minutely *serrate*.

Sessile, attached directly without a stalk.

Setaceous, *bristle-like*.

Sheath, a close-fitting tubular or enrolled case, e.g., the lower portion of the leaf of grasses.

Sigmoid, curved in two opposite directions like the Greek letter δ .

Sinus, the space between the divisions or lobes of a leaf.

Sinuate, with an irregular wavy margin.

Spadix, a spike with a thickened or fleshy axis and 1-sexual flowers, generally sheathed in a *spathe*.

Spathe, a large sheath-like bract enclosing a spadix. **Spathaceous**, *spathe-like*.

Spathulate, shaped like a *spatula*, i.e., broad and rounded at the apex but gradually narrowed towards the base.



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- Species**, a group of individuals alike in all essential particulars; the subdivisions of a genus.
- Spike**, a form of indefinite inflorescence with flowers sessile on an undivided elongated common axis. **Spicate**, in the form of or resembling a *spike*, or disposed in *spikes*. **Spikelet**, a secondary *spike*; the ultimate flower-bearing stem of grasses including its glumes and flowers.
- Spine**, a strongly pointed woody process generally originating from the wood-tissue. **Spinescent**, terminating in, or resembling, a *spine-like* sharp point; also becoming spinous. **Spinose**, spinous, furnished with, or of the nature of, *spines*.
- Stamen**, the male organ of a flower, consisting of a filament and an anther. **Staminode** an abortive or antherless stamen.
- Standard**, the posterior or odd petal of a papilionaceous corolla.
- Stellate**, *star-shaped*; with radiating rays like the points of a *star*.
- Stigma**, that part of the pistil which receives the pollen for the fertilization of the ovules.
- Stipe**, any stalk-like support; the stalk of an ovary above the floral whorls. **Stipitate**, having a *stipe*.
- Stipule**, an appendage of a leaf, usually one on either side of the petiole. **Stipulate**, having *stipules*. **Stipel**, a secondary *stipules*, the appendage of a leaflet. **Stipellate**, having *stipels*.
- Stomata**, pl. of **Stoma**, openings in the epidermis of plants with adaptations to regulate the passage of air and moisture.
- Stone**, the hard endocarp of a drupe. Syn. **Putamen**.
- Striate**, marked with thin longitudinal lines or minute furrows.
- Strigose**, covered with sharp-pointed straight stiff hairs of unequal length lying close along the surface, and all in the same direction, thus forming minute ridges.
- Style**, a tubular *stalk* proceeding from the summit of the ovary and supporting the stigma.
- Subulate**, shaped like a cobbler's *awl*; narrow, tapering and somewhat stiff.
- Superior**, inserted on the ovary or adnate to it, if said of the calyx; above the calyx and free from it, if said of the ovary.
- Suture**, a *seam* indicating the line of union of two parts; a line of opening.
- Symmetrical**, said of a flower having the same number of members in each whorl.
- Syncarpous**, composed of two or more *combined carpels*.
- Syngenesious**, said of stamens united by their anthers.
- Tendril**, a slender process usually belonging to the axis and serving as a support in climbing.
- Terete**, cylindrical, *rounded* in cross section.
- Ternate**, arranged in *threes* in a cluster or whorl.
- Testa**, the outermost coat of a seed.
- Tetramerous**, said of a flower having the parts or members in each whorl in *fours*.
- Tetrandrous**, with *four stamens*.
- Thalamus**, that part of the axis of a flower which supports the floral whorls and the pistil. Syn. **torus**, **receptacle**.



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- Thyrse** or **thyrsus**, a panicle, ovate or lanceolate in outline usually with cymose branches.
- Thyriform**, of the shape of a *thyrsus*. **Thyrroid**, somewhat like a *thyrsus*.
- Tomentose**, covered with hairs which are very short, soft, rather dense and more or less intricate.
- Torulose**, cylindrical with contractions at regular intervals.
- Torus**, same as receptacle or thalamus.
- Trichotomous**, with the divisions always in *threes* and of more or less the same length.
- Trimerous**, said of a flower having the parts or members in each whorl in *threes*.
- Trimorphic**, having *three forms* of hermaphrodite flowers produced by the same species, but generally on different individuals.
- Triplinerved**, with a strong secondary nerve on either side of the midrib proceeding from near the base.
- Triquetrous**, sharply *three-cornered*.
- Truncate**, ending abruptly, as if with the end *cut off*.
- Tuber**, a thickened underground stem bearing buds or eyes.
- Tuberous**, swollen like a *tuber*.
- Tumid**, swollen.
- Turbinate**, *top-shaped*; like an inverted cone.
- Umbel**, a form of indefinite inflorescence in which several branches or pedicels radiate from the top of a common peduncle and are of nearly the same length.
- Undulate**, with a wavy margin.
- Unisexual**, of *one sex*; having the stamens and the pistil in separate flowers.
- Urceolate**, *urn-shaped*; tubular and contracted at or below the mouth.
- Utricle**, a 1-celled 1-seeded fruit with a thin and more or less loose pericarp.
- Valvate**, with the margins of the members of a whorl only meeting without overlapping. Also dehiscing by *valves*.
- Variety**, a group of individuals differing from others of the same species in certain striking particulars which, however, are not of a nature to justify specific rank; sub-divisions of a species.
- Venation**, the mode in which the *veins* are disposed in a leaf.
- Ventral**, relating to, inserted on, or opening by, the inner suture of a carpel.
- Ventricle**, a lateral swelling or bulging out. **Ventricose**, having a *ventricle*; unequally swollen.
- Verrucose**, covered with *wart-like* excrescences.
- Versatile**, swinging to and fro; said of anthers attached by the back to the top of the filaments.
- Verticillate**, arranged in a whorl.
- Villous**, more or less thickly covered with long soft simple hairs.
- Viviparous**, said of plants the seeds of which germinate before falling.
- Whorl**, a collective name for all similar members that are arranged in a circle round an axis.
- Wing**, any thin membranous appendage. **Wings**, the side petals of a papilionaceous corolla.
- Xylem**, woody tissue which is formed by the inner portion of a fibrovascular bundle.



CSL

FOREST FLORA OF THE SCHOOL CIRCLE, NORTH-WESTERN PROVINCES.

VEGETABLE KINGDOM.

- Seed-bearing plants, fertilized by pollen-tubes **I. PHANEROGAMS.**
 Cotyledons, two or more **A. DICOTYLEDONS.**
 Ovules in closed ovary, fertilized through stigma **a. Angiosperms.**
 Calyx and corolla both present.¹ **i. POLYPETALÆ.**
 Corolla of distinct petals² **1. Thalamifloræ.**
 Calyx of distinct sepals³; petals hypogynous. **2. Discifloræ.**
 Torus small or elongate, not expanded **3. Calycifloræ.**
 Torus thickened or expanded into a fleshy disk⁴ **ii. GAMOPETALÆ.**
 Calyx of combined sepals; disk thin; petals inserted on the calyx **iii. APETALÆ.**
 Corolla of combined petals⁵ **b. Gymnosperms.**
 Calyx or corolla or both wanting⁶ **B. MONOCOTYLEDONS.**
 Ovules naked, fertilized by direct contact with pollen **II. CRYPTOGRAMS.***
 Cotyledon one
 Spore-bearing plants, not fertilized by pollen-tubes

¹ *Exceptions.*—Petals wanting in some **RANUNCULACEÆ**, **BIXINEÆ** and **STERCULIACEÆ** among the **THALAMIFLOREÆ**; in some **RUTACEÆ**, **CELASTRINEÆ** and **RHAMNEÆ** among the **DISCIFLOREÆ**; and in a few **COMBRETACEÆ** and **SAMYDACEÆ** among the **CALYCIFLOREÆ**.

² *Exceptions.*—Petals more or less combined in some **TAMARISCINEÆ** and **TERNSTREMIACEÆ** among the **THALAMIFLOREÆ**, and in Sub-Order **MIMOSEÆ** of **LEGUMINOSÆ** among the **CALYCIFLOREÆ**.

³ *Exceptions.*—Sepals combined in **DIPTEROCARPEÆ**, **MALVACEÆ**, **STERCULIACEÆ** among the **THALAMIFLOREÆ**; and in **BURSERACEÆ**, **MELIACEÆ**, **SAPINDACEÆ**, and some **RUTACEÆ** among the **DISCIFLOREÆ**.

⁴ *Exceptions.*—Disk obsolete in **ILICINEÆ** and wanting in **CORIARIEÆ**.

⁵ *Exceptions.*—Petals free in some **MYRSINEÆ** and **STYRACEÆ**.

⁶ *Exceptions.*—A few plants of Order **EUPHORBIACEÆ** and the female flowers of Genus *Juglans* of Order **JUGLANDEÆ** have both calyx and corolla, and the perianth is double in Genus *Loranthus* of **LOBANTHACEÆ**.

* The **CRYPTOGAMS** are not treated of in this Flora.



KEY TO THE NATURAL ORDERS.

CSL

A. DICOTYLEDONS.—

a. ANGIOSPERMS.—

i. POLYPETALÆ.—

1. Thalamifloræ.

Stamens indefinite.

Carpels more or less distinct or solitary¹;
stamens free.

Herbs or soft-wooded climbing shrubs.

Generally trees or woody shrubs, rarely
climbing (e.g., *Schizandra* of
Order 3).

Sepals and petals usually 5, each in a
single whorl

Sepals and petals in threes, the latter
in two or more whorls.

Stipules² convolute; albumen
uniform.

Stipules 0; albumen ruminant.

Carpels combined.

Calyx-lobes imbricate in bud.

Leaves opposite, gland-dotted; sta-
mens 3- or 5-adelphous

Leaves alternate, not dotted; sta-
mens usually free.

Placentas axile

Placentas parietal.

Ovary long-stipitate; seeds ex-
albuminous

Ovary sessile; seeds albuminous

Calyx lobes valvate in bud.

Calyx irregular, adnate to the ovary,
lobes enlarged in fruit

Calyx regular, free, lobes not en-
larged.

Stamens monadelphous.

Anthers 1-celled

Anthers 2-celled

Stamens distinct

Stamens few,—never more than 10.

(Carpels more or less distinct in fruit.)

Flowers 3-merous.

Flowers minute; seeds curved

Flowers conspicuous; seeds not curved.

Flowers 5-merous.

Leaves fairly large; seeds not
winged.

Leaves minute (scale-like); seeds
winged.

1. RANUNCULACEÆ.

2. DILLENIACEÆ.

3. MAGNOLIACEÆ.

4. ANONACEÆ.

11. HYPERICINEÆ.

12. TERNSTROMIACEÆ.

7. CAPPARIDEE.

8. BIXINEÆ.

13. DIPTEROCARPEÆ.

14. MALVACEÆ.

15. STERCULIACEÆ.

16. TILIACEÆ.

5. MENISPERMACEÆ.

6. BERBERIDEÆ.

9. PITTOSPOREÆ.

10. TAMARISCINEÆ.

¹ Carpels combined in Genus *Anona* of Order ANONACE.

² Stipules absent in Genus *Schizandra*.



KEY TO THE NATURAL ORDERS.

CSL 3

A. DICOTYLEDONS.—

a. ANGIOSPERMS.—

i. POLYPETALÆ.—

2. Discifloræ.

- Placentas free-central ; fruit not elongated. 23. OLACINÆÆ.
 Placentas axile ; fruit not elongated.
 Styles quite free ; filaments often connate at the base.
 Leaves alternate ; fruit not winged . 17. LINEÆ.
 Leaves opposite ; fruit winged . , 18. MALPIGHIACEÆ.
 Styles more or less combined or solitary ; stamens free.
 Flowers symmetrical.
 Calyx imbricate.
 Torus elongated in fr. below the ovary.
 Leaves dotted, aromatic ; carpels combined (except in *Zanthoxylum*) . . . 19. RUTACEÆ.
 Leaves not dotted, bitter or astringent ; carpels distinct.
 Lvs. alternate ; stem terete . 20. SIMARUBEÆ.
 Lvs. opposite ; stem 4-angular. 31. CORIARIÆÆ.
 Torus not elongated below the ovary.
 Plants resinous.
 Leaves dotted ; fruit usually with more than one seed . 21. BURSERACEÆ.
 Leaves not dotted ; fruit 1-seeded (except in *Spondias*) 30. ANACARDIACEÆ.
 Plants not resinous.
 Stamens opposite to the petals. . . . 29. SABIACEÆ.
 Stamens alternating with the petals.
 Disk obsolete . . . 24. ILICINÆÆ.
 Disk conspicuous . . . 25. CELASTRINÆÆ.
 Calyx valvate.
 (Disk prominent ; stamens opposite to the petals.)
 Wood usually hard and close-grained, joints not swollen . 26. RHAMNÆÆ.
 Wood always soft and porous, joints swollen . . . 27. AMPELIDÆÆ.
 Flowers not symmetrical (except in *Staphylea*), calyx imbricate . . 28. SAPINDACEÆ.
 Styles more or less combined ; stamens monadelphous (except in *Cedrela*) . 22. MELIACEÆ.
 Placentas parietal ; fruit a 3-valved elongated pod-like capsule . . . 32. MORINGÆÆ



KEY TO THE NATURAL ORDERS.

CSL

A. DICOTYLEDONS.—

a. ANGIOSPERMS.—

i. POLYPETALÆ.—

3. Calycifloræ.

Calyx inferior, free¹; leaves with or without stipules.

Leaves stipulate.

Carpels distinct or solitary².

Fruit, a pod; calyx with the odd lobe inferior

33. LEGUMINOSÆ.

Fruit various, not a pod; calyx with the odd lobe superior

34. ROSACEÆ.

Carpels more or less combined.

Leaves alternate, usually dotted

41. SAMYDACEÆ.

Leaves opposite, not dotted

36. RHIZOPHOREÆ.

Leaves exstipulate; carpels combined

40. LYTHRACEÆ.

Calyx superior or more or less adnate to the ovary; leaves exstipulate.

Style simple.

Connective of anthers without any appendage.

Leaves aromatic, gland-dotted

38. MYRTACEÆ.

Leaves not aromatic, not dotted.

Carpel solitary; fruit angled or winged

37. COMBRETACEÆ.

Carpels more than one; fruit not angled or winged

43. CORNACEÆ.

Connective of anthers tubercled or spurred

39. MELASTOMACEÆ.

Styles 2 or more.

Stamens usually 10³; ovules numerous in each cell

35. SAXIFRAGEÆ.

Stamens rarely more than 5; ovule solitary in each cell

42. ARALIACEÆ.

¹ Calyx ultimately superior and adnate to the ovary in *Rosa*, *Pyrus*, *Cratægus* and *Cotoneaster* of Order ROSACEÆ.

² Carpels combined in *Pyrus*, *Cratægus* and *Cotoneaster* of Order ROSACEÆ.

³ Excepting *Itea* and *Ribes* which have 4-5 stamens.



KEY TO THE NATURAL ORDERS.

CSL 5

DICOTYLEDONS.—

a. ANGIOSPERMS.—

ii. GAMOPETALÆ.

Ovary inferior or adnate to the calyx.

Carpels usually more than one; anthers not united.

Leaves opposite; stamens 4-5.

Lvs. usually exstipulate

Lvs. always stipulate (unless whorled)

Leaves alternate, (exstipulate); stamens 8 or more

Carpel solitary; anthers united

44. CAPRIFOLIACEÆ.

45. RUBIACEÆ.

51. STYRACEÆ.

46. COMPOSITÆ.

Ovary superior or free.¹

Leaves alternate.

Stamens inserted on the receptacle (hypo- or epigynous).

Anthers opening at the apex

Anthers opening inward

47. ERICACEÆ.

50. EBENACEÆ.

Stamens inserted on the corolla.

Ovules indefinite; inflorescence often extra-axillary

Ovules definite; inflorescence axillary (often terminal in Order 56).

58. SOLANACEÆ.

Lvs. dotted; without milky juice

Lvs. not dotted; often with milky juice.

48. MYRSINÆ.

Prostrate or climbing shrubs

Large erect shrubs or trees

57. CONVULVULACEÆ.

49. SAPOTACEÆ.

Lvs. not dotted; without milky juice.

56. BORAGINÆÆ.

Leaves opposite.²

Flowers regular; ovary of 2 carpels.

Stamens 2

Stamens 5. Plants generally with milky juice.

52. OLEACEÆ.

Filaments united into a tube, anthers adnate to the stigma

Filaments free, anthers not adnate to the stigma

54. ASCLEPIADEÆ.

53. APOCYNACEÆ.

Stamens 4 or 5. Plants without milky juice

55. LOGANIACEÆ.

Flowers irregular; ovary of 2 to 4 carpels.

Fruit elongated, seeds winged

Fruit not elongated, seeds not winged.

59. BIGNONIACEÆ.

Bracts conspicuous; stem with swollen joints

Bracts minute or absent; joints of stem not swollen.

60. ACANTHACEÆ.

Ovary entire, style terminal

Ovary 4-lobed, style gynobasic

61. VERBENACEÆ.

62. LABIATÆ.

¹ Ovary half-inferior in *Mesa*, Order MYRSINÆÆ.

² Leaves alternate in *Jasminum humile*, Linn., Order OLEACEÆ.



KEY TO THE NATURAL ORDERS.

CSL

A. DICOTYLEDONS.—

a. ANGIOSPERMS.—

iii. APETALÆ.

Flowers 2-sexual.¹

Ovary superior, 1-celled.

Stamens opening by valves. (Aromatic plants)

Stamens opening by longitudinal slits.

Flowers bracteate.

Leaves stipulate. Plants prostrate or climbing, aromatic

Leaves exstipulate. Plants usually herbaceous, not aromatic

Flowers ebracteate.

Plants covered with silvery scales.

Plants not covered with silvery scales

Ovary inferior, 1-celled.

Plants always parasitic; ovule solitary, erect

Plants rarely parasitic; ovules 2-5, pendulous

Flowers 1-sexual.

Flowers not in catkins or spikes (except in *Morus*, URTICACEÆ).

Ovary 1-celled, 1-ovuled.

Leaves opposite and exstipulate, or 0; ovary inferior

Leaves usually alternate, stipulate; ovary superior

Ovary 3-celled with 1 or 2 ovules in each cell, superior

Male (sometimes also female) flowers in catkins or spikes.

Leaves simple, stipulate.

Flowers monœcious; ovary inferior; seeds not hairy

Flowers diœcious; ovary superior; seeds hairy

Leaves simple, exstipulate; ovary superior

Leaves pinnate, exstipulate; (flowers monœcious); ovary inferior

65. LAURINEÆ.

64. PIPERACEÆ.

63. AMARANTACEÆ.

67. ELÆAGNACEÆ.

66. THYMELEACEÆ.

68. LORANTHACEÆ
(*Loranthus*).

69. SANTALACEÆ.

68. LORANTHACEÆ
(*Viscum*).

71. URTICACEÆ.

70. EUPHORBIACEÆ.

74. CUPULIFERÆ.

75. SALICINEÆ.

73. MYRICACEÆ.

72. JUGLANDÆÆ.

b. GYMNOSPERMS.

Branches articulate; leaves opposite, rudimentary or broad

Branches not articulate; leaves alternate or fascicled, usually acicular

76. GNETACEÆ.

77. CONIFERÆ.

¹ Flowers 1-sexual and diœcious in *Piper*, Order PIPERACEÆ.



KEY TO THE NATURAL ORDERS.

B. MONOCOTYLEDONS.

CSL

i. SUB-CLASS *PETALOIDEÆ*.

Flowers with a coloured perianth, solitary or in umbels or racemes. *Fruit*, a capsule or berry.

- Flowers irregular, ovary inferior . . . 78. SCITAMINEÆ.
Flowers regular, ovary superior . . . 79. LILIACEÆ.

ii. SUB-CLASS *SPADIFLORÆ*.

Flowers not coloured, arranged on a more or less fleshy spadix. *Fruit*, a berry or drupe.

- Perianth biserially 6-lobed. Plants usually woody . . . 80. PALMEÆ.
Perianth none or rudimentary. Plants herbaceous.
Inflorescence naked; leaves sessile, linear, spongy . . . 81. TYPHACEÆ.
Inflorescence inside a spathe; leaves usually long-petioled, flat, not spongy . . . 82. AROIDEÆ.

iii. SUB-CLASS *GLUMIFERÆ*.

Flowers glumaceous, in variously arranged spikelets. *Fruit*, a caryopsis.

- Sheath of leaf entire; stem 3-quetrous.
Fl. subtended by a single glume . . . 83. CYPERACEÆ.
Sheath of leaf split; stem terete.
Fl. subtended by several glumes . . . 84. GRAMINEÆ.



THALAMIFLORÆ.

ORDER I. RANUNCULACEÆ ; G. P. N. 1.*

HERBS or climbing shrubs. *Leaves* alternate, rarely opposite, usually exstipulate, simple, much divided or compound. *Flowers* usually regular, generally ebracteate. *Sepals* 4-5 or more, usually deciduous, often coloured. *Petals* absent, or 3-5 or more, often minute or deformed. *Stamens* usually numerous, hypogynous, free. *Carpels* many or few, free, 1-celled, 1- or more-ovuled. *Stigma* simple. *Fruit* either of many achenes, or of follicles, rarely a berry. *Seeds* albuminous.

1. Clematis, Linn. ; G. P. n. 1.*

Climbing shrubs. *Leaves* opposite, exstipulate, usually compound. *Flowers* in axillary or terminal fascicles or panicles, rarely solitary. *Sepals* usually 4, valvate, petaloid. *Petals* 0. *Stamens* and *carpels* indefinite. *Fruit* a head of achenes usually with feathery styles.

Analysis of the Species.

(By Mr. J. S. Gamble.)

Flowers in axillary fascicles.

Flowers white or cream-coloured.

Seps. erect ; pedicels with 2 connate bracts. 1. *C. nepaulensis*.Seps. spreading ; pedicels without bracts. 2. *C. montana*.Flowers dull-purple. 3. *C. barbellata*.

Flowers in axillary panicles.

Sepals spreading.

Glabrous. Panicles many-flowered. 4. *C. Gouriana*.Pubescent. Panicles few-flowered. 5. *C. puberula*.

Sepals erect.

Petioles connate into a flat cup. 6. *C. connata*.

Petioles not so connate.

Leaves decomponently pinnate. 7. *C. nutans*.Leaves simply pinnate. 8. *C. Buchananiana*.

* Serial number in BENTHAM & HOOKER'S 'Genera Plantarum.'



1. RANUNCULACEÆ.

[*Clematis*.]

1. *C. nepaulensis*, DC. ; Fl. Br. Ind. i. 2.

A slender climber. *Leaves* ternately divided ; common petiole 1-1.5 in. ; terminal leaflet or lobe 2-3 by 3-5 in., lateral half as long or shorter, sessile or very shortly petioluled. *Flowers* many ; pedicels 1-2 in. long, with two hyaline bracts joined into a cup, pubescent above the cup. *Sepals* 4, erect, cream-coloured. *Filaments* glabrous, base broad. *Achenes* flat, hairy ; style 1.5 in. long in fruit.

Valleys in HIGHER HILLS above 6,000 ft., scarce.—Matkángará, Deotá, Mussoorie, etc.

Fl. Cold season. Fr. May.

2. *C. montana*, Ham. ; Fl. Br. Ind. i. 2. Vern. *Kauniá-báñi*, Jaunsar.

Stem thick, often 3 in. in diameter ; young parts pubescent. *Leaves* 3-foliolate, fascicled at the nodes, glabrescent ; petiole 1.5-3 in. long. *Leaflets* 1-3 in. long, ovate, toothed ; petiolule 1-3 in. *Flowers* 2-3 in. diam., white ; peduncles 2-4 in. long, generally exceeding the leaves. *Sepals* 4, 1-2 in. long, elliptical, spreading, pure-white. *Filaments* linear, short. *Carpels* hairy ; style 6-1 in. long, densely hairy, rather stout.

JAUNSAAR and TEHRI-GARHWAL, 8,—9,000 ft., fairly common. A very conspicuous plant during the month of May on account of its beautiful sprays of large white flowers, trailing over the tallest trees and very frequently over Deodar.

Fl. Apr., May.

3. *C. barbellata*, Edgew. ; Fl. Br. Ind. i. 3. Vern. *Kauni*, Jaunsar.

Stem rather thin. *Leaves* 3-foliolate, much like those of the last species. *Flowers* dull-purple, in axillary fascicles ; pedicels 1.5-3 in. long. *Sepals* 6-8 in. long, erect, pubescent on both surfaces, greyish-purple outside, villous at the margins. *Filaments* linear, often hairy, as long as the sepals or shorter ; anthers bearded at the back (whence the specific name). *Achenes* glabrous or puberulent ; style 1.5-1.8 in. long, brown-hairy.

JAUNSAAR, TEHRI-GARHWAL and OUTER HIMALAYA, above 7,000 ft., in shady places.—Mundáli, Deoban, Deotá, Mussoorie, etc.

Fl. May, June.

4. *C. Gouriana*, Roxb. ; Fl. Br. Ind. i. 4. Vern. *Bel Kúm*, *Bel Kangu*, Dán.

Stem thick, striate ; branches purple. *Leaves* bipinnate or biternate. *Leaflets*, 2-3.5 in. long, ovate, oblong or lanceolate, acuminate, entire or distantly toothed, cordate or rounded at the base, wholly glabrous or rarely pubescent beneath, rather coriaceous. *Flowers*

1. RANUNCULACEÆ.

CSL

greenish-white, small, in dense axillary panicles. *Sepals* 2·3 in. long, oblong, revolute; margins tomentose. *Filaments* narrow. *Achenes* lanceolate; style 1·5-2 in. long in fruit, very slender.

Common in the DŪN and up to 4,000 ft. in the OUTER HIMALAYA. Also found in the SIWALIKS.

Fl. Aug., Sept.

5. *C. puberula*, Hook. f. & T.; Fl. Br. Ind. i. 4.

Stem grooved, moderately thick, downy. *Leaves* pinnate. *Leaflets* 1-1·5 in. long, ovate-lanceolate, entire or toothed. *Panicles* shorter than the leaves, few-flowered; branches opposite, subtended by leaf-like green bracts. *Sepals* 5, 5 in. long, silky without. *Achenes* ovoid, silky; style about 1 in. long in fruit.

Valleys in the HIMALAYA, at 2-4,000 ft.: Tiuni, Májog, Dhár-migádh, etc.

Fl. Sept., Oct.

6. *C. connata*, DC.; Fl. Br. Ind. i. 6. Vern. *Káuni-báli*, Jaunsar.

Stem thick; young parts with scattered hairs. *Leaves* pinnate or 3-foliolate, glabrous; petiole connate into a large flat cup (whence the specific name). *Leaflets* 2-4 in. long, broad-ovate, serrate or lobed; base cordate. *Panicles* many-flowered. *Flowers* white, large. *Sepals* oblong, hairy, not ribbed. *Filaments* tapering, hairy. *Achenes* ovate, pubescent; style 1·5-2 in. long in fruit.

Forests of UPPER HILLS above 5,000 ft., not very common: Bhújkōti, Mundáli.

Fl. May, June. Fr. Sept., Oct.

7. *C. nutans*, Royle; Fl. Br. Ind. i. 5. Vern. *Nák-chhikni*, *Kángūli*, Málkōt; *Káuni*, Jaunsar.

Stem slender, woody, furrowed, very pungent to the taste. *Leaves* decompositely pinnate. *Leaflets* 1-3 in. long, ovate or lanceolate, usually 3 5-lobed, silky. *Flowers* cream-coloured, in much-branched panicles; pedicels with a pair of green bracts which are often leaf-like and subtend flower-buds. *Sepals* 5·7 in. long, oblong, closely nerved, silky outside. *Filaments* tapering, silky near the base. *Achenes* large, silky-hairy; style 1-1·5 in. in fruit, very slender.

OUTER HIMALAYAN slopes, 3-5,000 ft.: Málkōt, above Rájpur. Bindál Nadi near Dehra Dún (Mr. C. W. Hope).

The leaves are very pungent to the taste and produce violent sneezing if smelt after bruising.

Fl. Nov., Dec.



1. RANUNCULACEÆ.

[*Clematis*.]

8. *C. Buchananiana*, DC.; Fl. Br. Ind. i. 6. Vern. *Kauni Bāli*, Jaunsar.

Stem thick, woody; branches widely climbing, pubescent when young. *Leaves* simply pinnate. *Leaflets* 2-4 in. long, ovate or orbiculate, coarsely lobed or serrate, pubescent; base cordate. *Flowers* large, cream-coloured, sweet-scented, in many-flowered panicles. *Sepals* thick, ribbed, softly silky-tomentose. *Filaments* and *achenes* densely hairy.

Villages in the HIMALAYA above 4,000 ft. Scarce in JAUNSAAR, but common in parts of TEHRI-GARHWAL, e.g., Mautārgādh.

Fl. Oct., Nov.

C. acuminata, DC.; Fl. Br. Ind. i. 5. Has been found by Mr. Gamble at the Bear-garden near Chakrata. It is a slender climber with glabrous leaves and cream-coloured flowers. *Roots* thick, fleshy, tuberous.

C. grata, Wall.; Fl. Br. Ind. i. 3—probably also occurs. It is a woody climber with a furrowed stem. *Panicles* decompound.

The following plants of herbaceous Genera are commonly met with and deserve mention:—

1. *Anemone vitifolia*, Ham.; Fl. Br. Ind. i. 8.—A perennial herb with 5-lobed radical leaves. *Flowers* large, white, in many-flowered scapes. *Seeds* white, woolly. Chakrata and the hills beyond, also Mussoorie and Mālkōt.—*G. P. n. 4*.

2. *A. obtusiloba*, Don; Fl. Br. Ind. i. 8. Vern. *Ageli*, Jaunsar.—A herb with a thick densely white-woolly root-stock. *Radical leaves* 3-lobed, deeply cordate, densely silky-pubescent. *Flowers* varying in colour from blue to white. Above 8,000 ft.: Maudāli, Deoban, etc.

3. *A. rivularis*, Ham.; Fl. Br. Ind. i. 9.—*Stem* branched. *Radical leaves* 3-lobed. *Flowers* in many-flowered compound cymes, bluish outside. *Achenes* dark-brown, lanceolate, hooked at the tip. In damp places and snow gullies in the HILLS, above 5,000 ft.

4. *Delphinium denudatum*, Wall.; Fl. Br. Ind. i. 25. The Larkspur. Vern. *Main*, Jaunsar.—Very conspicuous in the spring season on dry grassy slopes in the hills up to 8,500 ft. *Stem* branched. *Radical leaves* 5-9-partite, orbicular. *Flowers* pale-blue, spurred. *Fruit* of 1-7 follicles.—*G. P. n. 25*.

5. *Actæa spicata*, Linn.; Fl. Br. Ind. i. 29. Is an erect perennial herb with 3-nately compound leaves and small white flowers in

crowded racemes. *Sepals* and *petals* similar. Shady ravines in JAMNAR and TEHR-GARHWAL.—*G. P. n. 27*.

6, *Pæonia emodi*, Wall.; Fl. Br. Ind. i. 30. A tall almost shrubby plant, remarkable for its large showy white or pink flowers, found in the upper Tons valley as at Dátmir, and elsewhere from 8,000 to 10,000 ft.—*G. P. n. 30*.

ORDER 2. DILLENACEÆ; G. P. N. 2.

Trees or shrubs, rarely herbs. *Leaves* alternate, simple, generally without stipules. *Flowers* large, showy. *Sepals* 5, imbricate, persistent. *Petals* 5, rarely 3 or 4, deciduous. *Stamens* numerous, hypogynous, in many series. *Carpels* solitary or numerous, free or cohering in the axis. *Styles* distinct. *Seeds* solitary or many, arillate or immersed in pulp.

1. *Dillenia*, Linn; G. P. n. 10.

1. *D. indica*, Linn.; Fl. Br. Ind. i. 36; Brandis For. Flora 1; Gamble Man. Ind. Timb. 2. Vern, *Chálta*, Hind.

An evergreen tree; bark reddish-grey, red inside, peeling off in hard flakes. *Leaves* generally approximate at the ends of the branches, 8-12 in. long, oblanceolate or oblong-lanceolate, sharply serrate, acute or acuminate, glabrous above, usually pubescent beneath; lateral nerves very numerous, parallel, prominent; petiole sheathing at the base. *Flowers* terminal, solitary, 6-8 in. across. *Sepals* orbicular, thick and fleshy, with membranous margins, spreading in flower, accrescent and enclosing the ovary in fruit. *Petals* 3-4 in. long, obovate, white, very tender; margins wavy. *Inner stamens* recurved. *Fruit* 3-5 in. diam., fleshy, enclosed in the thickened sepals. *Seeds* reniform, sunk in a glutinous pulp.

Commonly cultivated at DEHRA and SAHÁRANPUR.

Wood reddish-brown, mottled with white specks, weighing about 45 lbs. per c. ft., fairly durable; medullary rays broad and shining. The fleshy calyx has an agreeable acid taste, and is eaten raw or cooked.

Fl. June, July. Fr. ripens in the cold season.



ORDER 3. MAGNOLIACEÆ; G. P. N. 4.

Trees or shrubs, sometimes climbing; wood-tissue with glandular markings. *Leaves* alternate, simple, entire or toothed, usually stipulate; stipules convolute, deciduous. *Flowers* axillary or terminal, often large, trimerous. *Sepals* and *petals* usually similar, hypogynous, deciduous. *Stamens* indefinite, free or monadelphous; filaments usually flattened. *Carpels* indefinite, often arranged on an elongated torus; style usually short. *Fruit* of berry-like or follicular carpels, or like a woody cone.

Analysis of the Genera.

Trees. Stipules conspicuous.	.	.	.	1. MICHELIA.
Climbing shrubs. Stipules none.	.	.	.	2. SCHIZANDRA.

1. *Michelia*, Linn.; G. P. n. 6.

1. **M. Champaca**, Linn.; Fl. Br. Ind. i. 42; Brandis For. Flora 3; Gamble Man. Ind. Timb. 6. Vern. *Champa*, Hind.

A tall, graceful, evergreen tree with dark-grey bark. *Leaves* 6-8 by 2-3.5 in., ovate or oblong-lanceolate, coriaceous, entire, glabrous, dark-green and shining above, enveloped in convolute stipules in bud; main lateral nerves 8-14 pairs; base acute; petiole 1-1.2 in. long. *Flowers* solitary, axillary, bracteate, pale-yellow, very fragrant; peduncle short, stout; bracts small, deciduous. *Sepals* and *petals* 15-21, in several series, those of the inner series gradually narrower. *Fruit* 3-4 in. long; carpels 5-7 in. long, subsessile, dark-coloured, with white specks.

Cultivated in the DŪN, and also in the SAHĀRANPUR DISTRICT.

Heartwood light olive-brown, very durable, seasons and polishes well; weight about 38 lbs. per c. ft. It is used for furniture. The flowers are used by Hindus in religious ceremonies and are indispensable on certain occasions.

Fl. chiefly Apr.-June, but occasionally throughout the year.

2. *Schizandra*, Michaux; G. P. n. 8.

Climbing glabrous shrubs. *Leaves* exstipulate. *Flowers* axillary, 1-sexual, white, yellow or orange.



Sepals and *petals* 9-12, generally in 3 series. *Stamens* 5-15 or more, spirally arranged; filaments short, free or connate into a fleshy head; anthers free, or sessile and half-buried in the head of connate filaments; cells small, remote. *Ovaries* many, densely imbricated; stigma sessile; ovules 2, pendulous. *Fruit* an elongated spike of 1-seeded globose carpels. *Seeds* with copious albumen.

Analysis of the Species.

- Filaments free above, anthers free 1. *S. grandiflora*.
Filaments connate into a fleshy head, anthers
imbedded in the head. 2. *S. propinqua*.

1. ***S. grandiflora***, Hook. f. & T.; Fl. Br. Ind. i. 44;
Brandis For. Flora 571. Vern. *Báillon*, *Bónoi*, Jaunsar.

A climber with dark-brown smooth bark and short leaf-bearing branches at the nodes. *Leaves* 3-6 in. long, elliptic to oblong-lanceolate, acuminate, distantly glandular-toothed, rather soft and fleshy, shining above, pale beneath; lateral nerves 6-8 pairs, faint; base acute; petiole .5-1 in. long. *Flowers* dioecious, axillary, white, fragrant, about 1 in. diam.; pedicels 1-2 in. long, of male flowers somewhat shorter. *Sepals* and *petal* 9-12, imbricate. *Stamens* in a spiral series, monadelphous below, free and tubular above. *Ovaries* imbricated on a conical receptacle which lengthens in fruit into a fleshy axis 6-9 in. long, bearing numerous scarlet carpels.

JAUNSAK and TEHRI-GARHWAL, 6-10,000 ft., affecting shady places: Deoban, Mundáli, Bámsu, Deotá, etc. Common but not abundant.

Fl. May, June. Fr. July, Aug.

2. ***S. propinqua***, Hook. f. & T.; Fl. Br. Ind. i. 45.

A stout climber with dark-brown stem and rough verrucose branches. *Leaves* 4-6 by 1.5-2 in., ovate-lanceolate, acuminate, obscurely gland-toothed, subcoriaceous, dark-green; lateral nerves 10-12 pairs, not prominent; base rounded; petiole .4-.6 in. long, rather stout. *Flowers* .5-.7 in. diam., yellowish; pedicels .4-.7 in. long, bracteolate. *Sepals* and *petals* imbricate, concave in bud. *Stamens* connate into a globose head about .3 in. diam.; anthers sessile, half-exserted. *Ovaries* and *fruit* as in the preceding species.

Very scarce. Korwá forests, JAUNSAK; also below MUSSOORIE. About 5,000 ft.

Fl. June, July.



ORDER 4. ANONACEÆ ; G. P. N. 5.

Trees or shrubs. *Leaves* alternate, simple, entire, exstipulate, often aromatic. *Flowers* usually 2-sexual. *Sepals* 3, free or connate, generally valvate. *Petals* 6, hypogynous, in two series, the inner sometimes absent. *Stamens* indefinite, filaments short or none; anthers adnate, with a connective enlarged to form a dilated or truncate head. *Ovaries* usually numerous, apocarpous, (syncarpous in *Anona*); style short or stigma sessile. *Fruit* of dry or succulent usually indehiscent carpels. *Seeds* large; testa horny; albumen ruminant.

1. *Miliusa*, Leschen. ; G. P. n. 34.

1. *M. velutina*, Hook. f. & T. ; Fl. Br. Ind. i. 87 ; Brandis For. Flora 6 ; Gamble Man. Ind. Timb. 9. Vern. *Dôm Sâl*, Hind. ; *Guâ Sâl*, Garhwal.

A middle-sized deciduous tree ; young branches tomentose ; bark dark-grey, rough ; inner substance dirty brown. *Leaves* 6-10 by 3.5-6 in., ovate elliptic or oblong, acute or acuminate, entire, softly tomentose on both surfaces, aromatic ; base cordate ; petiole 1-2 in. *Flowers* pale-yellow, in 3-6-flowered lax leaf-opposed racemes ; peduncles 5-1 in. long, pedicels 2-4 in., slender. *Sepals* and *outer petals* similar, 1 in. long, ovate, valvate in bud ; *inner petals* longer, broad-ovate, dark-brown, densely tomentose outside. *Stamens* on a cylindrical torus ; anthers distinct. *Fruit* of a number of black dry 1-2-seeded berry-like carpels, on short stipes.

Common in the Sâl forests of DEHRA DŪN and SAHÂRANPUR ; generally in ravines, or in open scrubby jungles.

Heartwood not distinct. The seasoned wood is fairly hard, light, of pretty grain ; weight 40-50 lbs. per c. ft. It is used for agricultural implements, and in constructions of a temporary character.

Fl. Mar.-May. Fr. June, July.

To this Family belong—

1. *Anona squamosa*, Linn. ; Fl. Br. Ind. i. 78, Vern. *Sharifâ*, *Sitâphal*, Hind. the Custard-apple ; and

2. *A. reticulata*, Linn. ; Fl. Br. Ind. i. 78. Vern. *Nonâ*, Hind. the Bullock's heart.

Both occasionally, but not commonly, cultivated in the DŪN, more frequently in SAHÂRANPUR.—G. P. n. 30.

ORDER 5. MENISPERMACEÆ ; G. P. N. 6.

Climbing or twining, rarely erect shrubs. *Leaves* alternate, simple, entire or lobed, usually palminerved, exstipulate. *Flowers* small, usually dioecious. *Sepals* and *petals* similar, generally 6 each, in series of 3, the outermost whorl of sepals very minute. **MALE FL.:** *Stamens* usually 6, opposite to the petals, hypogynous; filaments or anthers free or connate. **FEM. FL.:** *Carpels* 3, rarely 1, 6, or more; ovules solitary. *Fruit* a 1-seeded drupe. *Seed* curved into a crescent shape (whence the name of the Order), enclosed in a woody endosperm, usually with copious albumen.

1. *Cocculus*, DC.; G. P. n. 16.

Climbing or erect shrubs. *Flowers* panicle. *Sepals* 6, in two series. *Petals* 6, concave, embracing the stamens in the male flowers. *Styles* usually cylindrical. *Drupe* circular, laterally compressed; endocarp horse-shoe-shaped, tubercled.

Analysis of the Species.

- | | |
|--|----------------------------|
| A large erect shrub, leaves glabrous . . . | 1. <i>C. laurifolius</i> . |
| A climbing shrub, leaves villous. . . | 2. <i>C. villosus</i> . |

1. *C. laurifolius*, DC.; Fl. Br. Ind. i. 101; Brandis For. Flora 9; Gamble Man. Ind. Timb. 12. Vern. *Tilphāra*, Dūn and Garhwal.

A small evergreen tree with a short trunk and thin grey bark; branchlets with tufts of hairs at the base. *Leaves* 3-6 in. long, lanceolate, entire, dark-green and shining above, slightly pale beneath; base 3-nerved, acute; petiole 1-3 in. *Panicles* axillary, solitary or 2 together, corymbose. *Flowers* minute; petals 2-lobed. *Styles* reflexed. *Drupe* 15 in. diam., black when ripe.

Shady woods and moist places up to 4,000 ft. Banks of the Sōng opposite Kāluwāla, Nakraundā, Bindāl nālā, etc. in the Dūn. Jumná valley down to Dākhpathār. Moist ravines in the LOWER HILLS.



5. MENISPERMACEÆ.

[*Cocculus*.]

The wood is of a curious structure, having belts of corky tissue alternating with woody bands and looking like annual rings, which they obviously are not, as they frequently anastomose. It is used only for fuel.

Fl. Apr.-June.

2. *C. villosus*, DC.; Fl. Br. Ind. i. 101; Brandis For. Flora 9.

A climbing undershrub with tomentose branchlets. *Leaves* very variable in size, the largest 3 by 2 in., ovate or ovate-oblong, mucronate, clothed with grey tomentum; petiole up to 5 in. *Male flowers* in axillary panicles; *fem. fls.* 1-3 together on short axillary pedicels. *Drupe* 2 in. diam., dark-purple.

Foot of the HIMALAYA and SIWALIK FORESTS, not very common.

"The juice of the ripe berries makes a durable bluish-purple ink"—*Sir D. Brandis*. The roots and leaves are used medicinally.

Fl. Feb., March.

The following climbers belonging to this Family deserve mention :—

1. *Tinospora cordifolia*, Miers; Fl. Br. Ind. i. 97. Vern. *Gulel, Guloh, Giloh*, Hind. A succulent climber which sends down long filiform aerial roots from the branches from which the epidermis can be easily sloughed off. *Leaves* 3-5 in. dia., orbicular, deeply cordate, abruptly cuspidate-acuminate; petiole 1.5-2.5 in. On trees in shady places in the DÚN and SAHÁBANPUR FORESTS, fairly common. A kind of starchy substance is extracted from the stem and aerial roots, which is much valued in native medicine.—*G. P. n. 5*.

2. *Stephania rotunda*, Lour.; Fl. Br. Ind. i. 103. Vern. *Parhá, Dún*. A climber fairly common in ravines in the DÚN and the LOWER HILLS. *Leaves* 3-6 in. diam., ovate-rotundate, peltate, with 9-10 radiating nerves; petiole 4-6 in. *Flowers* in compound umbels.—*G. P. n. 20*.

3. *Cissampelos Pareira*, Linn.; Fl. Br. Ind. i. 103. Vern. *Parbik, Dakh-nirbisi*, Hind.; *Parhé, Dún* and Garhwal. A climber with a short perennial stem which annually throws out long twining branches covered with grey tomentum. *Leaves* 3-4 in. long, triangularly broad-ovate, subpeltate, obtuse but mucronate. *Fem. fls.* in long racemes, each flower in the axil of a large foliaceous bract. *Drupe* 2 in. diam., scarlet when ripe. Common in the DÚN and at low levels in the HILLS. The leaves and roots are used in medicine.—*G. P. n. 21*.

ORDER 6. BERBERIDÆE; G. P. n. 7.

Erect or climbing shrubs, rarely herbs, glabrous. *Leaves* simple or compound, alternate or fascicled, usually exstipulate. *Flowers* regular, yellow or white. *Sepals* and *petals* free, hypogynous, caducous, in 2-4 series, usually imbricate. *Stamens* hypogynous, usually as many as the petals and opposite to them. *Carpels* 1-3, rarely more, oblong; style short or 0; stigma dilated. *Fruit* baccate or dry.

Analysis of the Genera.

Climbing shrubs with digitate leaves.	1. HOLBÆLLIA.
Erect shrubs with simple or pinnate leaves.	2. BERBERIS.

1. Holbœllia, Wall.; G. P. n. 6.

1. *H. latifolia*, Wall.; Fl. Br. Ind. i. 108; Brandis For. Flora 13. Vern. *Gophlá*, *Jangli Sharifá*, Mussoorie.

A climbing shrub; stem corky when old. *Leaves* alternate, digitate, 3-9-foliolate. *Leaflets* very variable in size and shape, 3-5 by 5-2 in., broadly or narrowly ovate, oblong or ovate-lanceolate, entire, acuminate, generally coriaceous, shining above, pale beneath; common petiole 3-4 in., petiolule 3-1 in., long. *Flowers* monœcious, in axillary fascicles or racemes, purplish-green, sweet-scented. *Sepals* 6, in two series. *Petals* 6, minute. *Stamens* 6; anthers dehiscent by slits. *Berries* oblong, 2-3 in. long.

Shady ravines in the HILLS, above 5,500 ft.: Deotá, Korwá, Chakrata, etc.

Fl. Apr., May. Fr. Sept., Oct.

There are two distinct varieties of this plant:—

Var. *latifolia*, sp. Wall., with 3-5 ovate or oblong leaflets common in the OUTER HILLS; and

Var. *angustifolia*, sp. Wall., with 5-9 linear-lanceolate leaflets, which occurs at and beyond Deotá.

2. Berberis, Linn.; G. P. n. 8.

Spinous shrubs; wood yellow. *Leaves* pinnate and alternate, or simple and fasciculate. *Flowers* yellow,



Sexual, 2-3-bracteate. *Sepals* 6, in two series. *Petals* 6, also in two series. *Stamens* 6, free; anthers dehiscing by two recurved valves. *Ovary* simple; stigma sessile or on a short style. *Fruit* a berry.

Analysis of the Species.

- | | |
|---|---------------------------|
| Leaves imparipinnate. | 1. <i>B. nepalensis</i> . |
| Leaves simple. | |
| Flowers umbellate. | 3. <i>B. umbellata</i> . |
| Flowers racemed. | |
| Leaves membranous, closely serrate; stigma sessile. | 2. <i>B. vulgaris</i> . |
| Leaves coriaceous, reticulate, entire or remotely toothed. | |
| Leaves obovate or broadly oblanceolate; stigma subsessile. | |
| Branches and pedicels red; racemes branched. | 4. <i>B. aristata</i> . |
| Branches grey, pedicels pale-red or green; racemes not branched. | 5. <i>B. coriaria</i> . |
| Leaves narrow-oblanceolate; stem white; style distinct. | 6. <i>B. Lycium</i> . |
| Leaves broad-obovate, strongly reticulate; stem pale; style distinct. | 7. <i>B. asiatica</i> . |

1. ***B. nepalensis***, Spreng.; Fl. Br. Ind. i. 109; Brandis For. Flora 12; Gamble Man. Ind. Timb. 13. Vern. *Khōru*, Jaunsar.

A small tree or large shrub with soft corky bark. *Leaves* coriaceous, shining, imparipinnate, with two recurved subulate spinescent stipules. *Leaflets* 2-12 pairs, 2-3·5 in. long, ovate or lanceolate, sessile, with 3-8 large spinous teeth on either side, shining above. *Bracts* 1-2 in. long, persistent, clothing the ends of the branches; bracteoles broad-ovate or oblong, deciduous. *Racemes* dense-flowered, 4-10 in. long, erect, in the axils of the bracts. *Flowers* yellow; pedicels 3-5 in. long. *Berries* 3-5 in. long, elliptic or globose, purple, glaucous.

JAUNSAAR, 6,800 ft. Common near Chakrata.

The fruit is eaten.

Fl. Apr., May. Fr. May, June.

NOTE.—Like the English name *Barberry*, the Jaunsari names *Kāshmoi* and *Kāshmal* and the Garhwali name *Kingorā* are applied indiscriminately to the following species, while their roots are sold by the dealers of country-drugs under the common name of *Rasaunt* or *Dāruhaid* (Sans. *Dāruharidrā*).



2. **B. vulgaris**, Linn.; Fl. Br. Ind. i. 109; Brandis For. Flora 11; Gamble Man. Ind. Timb. 13. Vern. *Chatroá*, Jaunsar.

A small shrub with soft brown bark. *Leaves* deciduous, 1-3 in. long, broadly obovate or spatulate, membranous, finely serrate, narrowed into a slender petiole which is 1-1 in. long; spines 3-7-forked, rarely simple. *Flowers* pale-yellow, in simple racemes which are generally longer than the leaves. *Berries* oblong-ovoid, red when ripe.

JAUNSAR and TEHRI-GARHWAL, 8,12,000 ft.: Deoban. Not very common.

The fruit is eaten.

Fl. Mar., Apr.

There are several varieties of this species, some of which seem specifically distinct, and differ considerably in appearance and foliage from the type. One of these is found at Lokāndi, Gidhi Khad and Rikhshin. Is it var. *cratægina*, sp. DC.?

3. **B. umbellata**, Wall.; Fl. Br. Ind. i. 110.

A small shrub, generally occurring in gregarious patches; branches slender. *Leaves* 1-2 in. long, obovate, rather membranous, sparingly serrulate. *Flowers* yellow, somewhat unevenly umbellate on a long peduncle; pedicels slender. *Berries* oblong.

JAUNSAR and TEHRI-GARHWAL, 9,11,000 ft.: Gidhi Khad, Rikhshin, etc.

Fl. Apr., May.

4. **B. aristata**, Roxb.; Fl. Br. Ind. i. 110; Brandis For. Flora 12; Gamble Man. Ind. Timb. 13. Vern. *Káshmoi*, Jaunsar; *Kingorá*, Garhwal.

An evergreen shrub 10-12 ft. high; branches usually bright red. *Leaves* 2-3 in. long, obovate or oblanceolate, rather coriaceous, entire or with a few remote teeth, in the axil of a 3-fid or simple spine. *Flowers* bright-yellow, in cymosely branched racemes; peduncle 1-1.5 in. long, red; branches few-flowered; pedicels 2-3 in. long, also red. *Berries* tapering into a very short style, red.

JAUNSAR and TEHRI-GARHWAL, 6,9,000 ft. Common.

An extract from the stem and roots is used in medicine.

Fl. Apr., May. Fr. June, July.

5. **B. coriaria**, Royle, Syn.—*B. aristata* var. *floribunda*, Wall.; Fl. Br. Ind. i. 110. *B. coriacea*, Brandis; Gamble Man. Ind. Timb. 14. Vern. *Káshmoi*, Jaunsar; *Kingorá*, Garhwal.



6. BERBERIDÆ.

[*Berberis*.]

A large thorny shrub with grey bark; branches grey, rarely reddish, rather stouter than those of *B. aristata*. Leaves 3-4 in. long, obovate, entire or distantly sharp-toothed, green beneath; veins very fine or indistinct. Flowers usually in simple racemes which are 2-3 in. long; peduncle slightly angled; pedicels 2-3 in. long. Berries ovoid, purple, covered with a glaucous bloom.

HIGHER HILLS, 7,-9,000 ft. Common at Bodvár, Konáin, Deoban and Lambátách.

Economic use as of *B. aristata*.

Fl. May, June. Fr. July, Aug.

6. *B. Lycium*, Royle; Fl. Br. Ind. i. 110; Brandis For. Flora 12; Gamble Man. Ind. Timb. 12. Vern. Chatroi, Káshmal, Jaunsar.

A shrub usually much smaller than the last two species, and somewhat gregarious in habit; bark white. Leaves 1.5-2.5 in. long, oblanceolate, subsessile, mucronate, coriaceous, glaucous beneath, with prominent reticulate veins. Racemes simple or compound, generally exceeding the leaves; peduncle glaucous. Flowers dull-yellow. Berries ovoid, violet, with a distinct style at the apex.

JAUN SAR, TEHRI-GARHWAL, and OUTER HIMALAYA, 3,-7,000 ft. Quite abundant in certain localities: Korwá, Chakrata, Málkôt, below Mussoorie, etc.

Economic use as of the last two species.

Fl. April. Fr. May.

7. *B. asiatica*, Roxb.; Fl. Br. Ind. i. 110; Brandis For. Flora 12. Vern. Kingorá, Dán and Garhwal.

A much-branched spreading shrub with pale bark. Leaves 2-3 in. long, broad-obovate, hard, coriaceous, strongly reticulate and grey beneath, usually with large distant spinous teeth. Racemes corymbose, dense-flowered, shorter than the leaves. Flowers 2 in. diam., pale-yellow. Berries 4-5 in. long, ovoid, red or black, glaucous.

LOWER HILLS, generally between 3,000 and 5,000 ft., but along the OUTER HIMALAYAN STREAMS as low down as Tháno, 2,400 ft., the Bindál nadi near Dehra, 2,200 ft., and in the Suswa near Phándowála, 1,800 ft.

Berry edible.

Fl. Feb.-Apr. Fr. Apr.-June.

To this Family belongs the herbaceous plant *Podophyllum emodi*, Wall.; Fl. Br. Ind. i. 112. Vern. Rikhpotá, Jaunsar;—the rootstock of which yields the valuable medicine known as Podophylline

Leaves 2 or 3, 6-9 in. diam., 3- or more-lobed, margins laciniate and serrate. Flowers 1-1.5 in. diam, white or light-rose. Fruit ovoid, 1.5-2.5 in. long. Common in shady places above 7,000 ft. in JAUNSAR and TEHRIGARHWAL.—G. P. n. 18.

ORDER 7. CAPPARIDEÆ ; G. P. n. 12.

Herbs or shrubs, rarely trees. *Leaves* alternate, simple or palmately 3-9-foliolate. *Flowers* usually bisexual, cruciform, regular or irregular. *Sepals* 4, free or connate. *Petals* generally 4, hypogynous or seated on a disk. *Stamens* 4-8, or indefinite, inserted at the base of a gynophore; filaments slender; anthers versatile. *Ovary* usually long-stipitate, 1-celled; style short or 0; ovules indefinite, on parietal placentas. *Fruit* a berry or a capsule.

Analysis of the Genera.

Leaves simple. Generally climbing shrubs. . . 1. CAPPARIS.
Leaves trifoliolate. A tree. 2. CRATÆVA.

1. Capparis, Linn.; G. P. n. 17.

Shrubs, rarely trees, usually with stipulary thorns. *Leaves* simple, sometimes caducous. *Sepals* 4, usually free. *Petals* 4, sessile, imbricate. *Stamens* indefinite; filaments filiform. *Ovary* on a long gynophore; stigma sessile. *Fruit* a fleshy berry; seeds many.

Analysis of the Species.

Flowers large, solitary, axillary. 1. *C. spinosa*.
Flowers small, umbelled. 2. *C. sepiaria*.
Flowers large, 2-4 in vertical lines, supra-axillary. . . 3. *C. horrida*.

1. *C. spinosa*. Linn.; Fl. Br. Ind. i. 173; Brandis For. Flora 14. The Caper plant. Vern. *Kiári*, *Báuri*, Jaunsar.

A small trailing shrub; young parts covered with a white or yellowish caducous tomentum; thorns straight or recurved, rarely absent. *Leaves* 1-2 in. long, orbicular or broad-ovate, entire, thick,



7. CAPPARIDÆ.

[*Capparis*.]

mucronate, nearly glabrous. *Flowers* 1-3 in. diam., white, fading in to purplish red. *Sepals* unequal, concave. *Petals* 1 in. long, clawed, obovate, undulate. *Stamens* numerous, purple, longer than the petals. *Gynophore* as long as the stamens, with glands at the base. *Fruit* 1-3 in. long, red inside when ripe.

On dry hot rocks at low elevations in the HILLS.: Tons and Pábar valleys.

"The fruit is pickled, and the leaves and ripe fruit are a favourite food of goats and sheep."—*Sir D. Brandis*.

Fl. May-July. Fr. Cold season.

2. *C. sepiaria*, Linn.; Fl. Br. Ind. i. 177; Brandis For. Flora 15.

A large climbing shrub with thorny stem and branches. *Leaves* green, very variable, usually 1-2 in. long and ovate. *Flowers* white, 3-5 in. diam., in sessile or shortly peduncled umbels; pedicels slender, 5-8 in. long. *Sepals* ovate. *Petals* narrow-oblong. *Ovary* ovoid. *Fruit* 3 in. diam., black, on a short gynophore.

Scrub forests at the foot of the SAHÁRANPUR SIWALIKS e.g., Barkálá, Kasúmri, Kôtri, Ránipur, etc.

Fl. Rainy season.

3. *C. horrida*, Linn.; Fl. Br. Ind. i. 178; Brandis For. Flora 15. Vern. *Hís*, *Hîps*, *Kális*, *Kálhis*, *Kálhîns*, *Khális*, *Dún*; *Jhiri*, Hind.

A tall scrambling shrub, covered when young with ferruginous caducous tomentum; stem thickly beset with scattered thorns. *Leaves* 4 by 2-5 in. but often much smaller, oblong or ovate, mucronate. *Flowers* 1-5-2 in. diam., white, fading into dull-rose; pedicels 5-1 in. long, 2-4 in a vertical line above the leaf. *Stamens* very numerous, purple. *Fruit* subglobose, 1-1-5 in. diam., on a gynophore 1-5-2 in. long.

Common in scrub forests in the DÚN, and at the base of the SAHÁRANPUR SIWALIKS.: Kálsi, Ránipur, etc.

The leaves and twigs are eaten by goats, cattle and elephants.

Fl. Feb.-May. Fr. Aug., Sept.

2. *Crataeva*, Linn.; G. P. n. 21.

1. *C. religiosa*, Forst.; Fl. Br. Ind. i. 172; Brandis For. Flora. 16; Gamble Man. Ind. Timb. 15. Vern. *Bárna*, Saháranpur.

A moderate-sized deciduous tree; bark grey, fairly smooth, with long horizontal wrinkles. *Leaves* 3-foliate; petiole 4-6 in. long.



Leaves 3-6 by 1·3-3 in., ovate or ovate-lanceolate, acuminate, entire, glabrous, subcoriaceous, pale beneath; petiolules auriculate. *Flowers* 2-3 in. diam., pale-yellow or light-rose, in many-flowered lax terminal corymbs. *Sepals* 4, deciduous. *Petals* 4, long-clawed, oblong, ovate or spatulate, 1-1·5 in. long. *Stamens* numerous; filaments slender, free, exceeding the petals. *Ovary* on a long gynophore. *Stigma* sessile. *Fruit* a many-seeded ovoid berry, 1-2 in. diam., rough with white specks; seeds imbedded in a yellow pulp.

Foot of the SAHÁRANPUR SIWALIKS near Bádsháhibágh Mohand, Beribára, Gaj-Ráu Block, etc. Also Pathri forest. Rather scarce. Cultivated in gardens for the flowers.

Wood yellowish-white, moderately hard, even-grained; weight about 45 lbs. per c. ft. It is used for drums, models, writing boards, combs, and turnery. The leaves are lopped for cattle and camel-fodder.

Fl. Apr., May.

ORDER 8. BIXINEÆ ; G. P. N. 17.

Trees or shrubs. *Leaves* alternate, simple; stipules minute or 0. *Flowers* regular, 1-2-sexual. *Sepals* 4-5, imbricate, often deciduous. *Petals* 4-5 or 0, deciduous. *Stamens* often numerous and hypogynous. *Ovary* generally 1-celled; ovules parietal, usually numerous. *Fruit* either a dry capsule dehiscing by valves, or a fleshy indehiscent berry. *Seeds* arillate or with a pulpy testa; albumen copious.

Analysis of the Genera.

- | | |
|---|-------------------|
| Leaves lobed; petals large; fruit a capsule. | 1. COCHLOSPERMUM. |
| Leaves not lobed; petals none; fruit indehiscent. | |
| Styles 2 or more. | 2. FLACOURTIA. |
| Style 1. | 3. XYLOSMA. |

1. *Cochlospermum*, Kunth.; G. P. n. 1.

1. *C. Gossypium*, DC.; Fl. Br. Ind. i. 190; Brandis For. Flora 17; Gamble Man. Ind. Timb. 16. Vern. *Gejra*, *Arlá* Saháranpur.



A small deciduous tree with short branches and deeply cracked thick bark. *Leaves* palmately 5-lobed, 4-6 in. diam.; lobes acuminate, more or less tomentose beneath; petioles thick, 6-9 in. long. *Flowers* 2-sexual, 3-4 in. across; in terminal panicles, appearing before the leaves; peduncle and pedicels covered with grey tomentum. *Sepals* 5, ovate or elliptic, 5 in. long, silky. *Petals* 5, bright-yellow, obovate, 1-2 in. long, with numerous fine parallel veins. *Stamens* numerous, inserted on a disk; filaments 5-7 in. long, filiform; anthers opening by a slit at the top. *Fruit* an egg-shaped capsule, 5-valved; valves 2-3 in. long. *Seeds* covered with soft silky wool.

Common on dry slopes of the OUTER SIWALIKS, especially towards Rānipur.

Wood very soft, light and spongy, of no use. A white gum exudes from the bark which is used in native medicine under the name *Katirā*. A very showy tree in the hot season.

Leafless Dec.-Apr. Fl. Mar., Apr. Fr. June, July.

2. Flacourtia, Commers. ; G. P. n. 17.

Trees or shrubs, generally spinous. *Leaves* crenate. *Flowers* small, usually dioecious. *Sepals* 4-5, small, imbricate. *Petals* none. *Stamens* numerous; anthers versatile. *Ovary* on a glandular disk; styles 2 or more. *Fruit* a berry with many seeds.

Analysis of the Species.

- | | |
|---|----------------------------|
| Leaves long-acuminate, quite glabrous; fruit large. | 1. <i>F. Cataphracta</i> . |
| Leaves rounded or obtuse, tomentose beneath; fruit small. | 2. <i>F. Ramontchi</i> . |

1. *F. Cataphracta*, Roxb.; Fl. Br. Ind. i. 198; Gamble Man. Ind. Timb. 17. Vern. *Pachnālā*, *Jamnuā*, *Dūn*.

A small evergreen tree, bearing compound spines up to middle age; bark smooth. *Leaves* 3-5 in. long, ovate or ovate-lanceolate, long-acuminate, crenate, thin but tough, quite glabrous, shining above; base acute, rarely rounded; petiole 1-2 in. long. *Flowers* very small, in irregular racemes; stigmas 4-6. *Fruit* globose, 5-7 in. diam., crowned by the persistent stigmas, on peduncles 3-5 in. long, very acid, dark-purple when ripe.

Sál forests of the DÚN. Common along the banks of the Ré badi, and in other low-lying shady places. Occasionally in the SAHÁBANPUR DIVISION, e.g., at Dholkhand.

The wood is hard and compact and is used for agricultural implements. The acid fruit is eaten.

Fl. July, Aug. Fr. Nov., Dec.

2. **F. Ramontchi**, L'Herit.; Fl. Br. Ind. i. 193; Brandis For. Flora 18; Gamble Man. Ind. Timb. 17. Vern. *Kandái*, *Kandei*, Hind.; *Kángo*, E. Dún.

A small thorny deciduous tree with rough whitish-grey bark; young parts tomentose. *Leaves* 2-4 in. long, ovate obovate, or sub-orbicular, obtusely serrate or crenate, glabrous or glabrescent above, usually tomentose beneath; petiole 2-3 in. long, tomentose. *Flowers* small, greenish-yellow, in short racemes. *Sepals* rusty-hairy. *Stigmas* 5-11, free or connate. *Fruit* globose, 3-5 in. diam., subacid, red or dark when ripe; seeds 8-16.

Throughout the DÚN and SAHÁBANPUR FORESTS. Also MUS-
 SOORIE and MÁLKÔT HILLS; at Kálsi, Saia, and in the Tons valley
 in JAUNSA,—up to about 4,000 ft.; most abundant in scrub forests.

The wood is hard and durable, and is used for agricultural
 implements. The leaves and twigs are lopped for fodder. The fruit
 is eaten.

Leafless Feb., Mar. Fl. Mar., Apr. Fr. May, June.

3. *Xylosma*, Forster; G. P. n. 19.

1. **X. longifolium**, Clos.; Fl. Br. Ind. i. 194; Brandis
 For. Flora 19; Gamble Man. Ind. Timb. 18. Vern. *Siálu*, *Katári*
Kandhára, Dún; *Phaláma*, Garhwal.

A moderate-sized evergreen tree, thorny when young. *Leaves*
 3-6 by 1-2 in., oblong-lanceolate, obtusely serrate, coriaceous, glab-
 rous, shining above when young, deeper green but dull when old;
 petiole 2-4 in. long. *Flowers* small, yellow, dioecious, in short dense-
 flowered axillary panicles; pedicels bracteate. *Petals* none. *Style* 1,
 short. *Fruit* a 2-8-seeded more or less dry berry, about 2 in. diam.

Common in shady ravines throughout the DÚN, occasionally
 also in the SAHÁBANPUR-SIWALIKS. Also in valleys in the MUS-
 SOORIE and JAUNSA HILLS. Lachiwála, Mohkumpur, Karwápáni,
 Ámbári, Chilláwáli Ráu, etc.

The wood is pinkish, moderately hard and even-grained, used
 chiefly for fuel and charcoal; weight 55 lbs. per c. ft.

Fl. Nov.-Jan. Fr. Mar.-May.



9. PITTOSPOREÆ.

[*Pittosporum*.]

ORDER 9. PITTOSPOREÆ; G. P. N. 18.

Trees or shrubs, sometimes climbing. *Leaves* alternate, rarely subverticillate, usually entire, exstipulate. *Flowers* usually 2-sexual. *Sepals* and *petals* 5 each, imbricate. *Stamens* 5, hypogynous, alternating with the petals; anthers versatile. *Ovary* 1-celled with 2-5 parietal placentas; ovules many; style simple; stigma 2-5-lobed. *Fruit* capsular or indehiscent. *Seeds* usually many.

1. *Pittosporum*, Banks; G. P. n. 1.

Trees or shrubs. *Sepals* and *petals* free or connate at the base. *Stamens* erect; filaments subulate. *Ovary* usually 2-valved. *Fruit* a 1-celled 2-valved capsule. *Seeds* smooth, imbedded in a viscid pulp.

Analysis of the Species.

(Sir D. Brandis.)

Leaves, young branches and capsule glabrous. 1. *P. floribundum*.
Leaves, young branches and capsule tomentose. 2. *P. eriocarpum*.

1. *P. floribundum*, W. & A.; Fl. Br. Ind. i. 199; Brandis For. Flora 19.

A small handsome tree with a short trunk and spreading branches; bark ash-colour or yellowish-grey, rough with small white specks. *Leaves* 3-6 in. long, lanceolate or elliptic-oblong, acute or acuminate, thinly coriaceous, shining above; margins wavy or obscurely toothed; midrib prominent; lateral nerves faint; petiole .5-7 in. long. *Flowers* yellowish, numerous, about 3 in across, in corymbosely branched short terminal panicles. *Sepals* subciliate. *Petals* free, linear-oblong. *Style* persistent. *Capsules* the size of a pea, rugose; seeds about 6, in a red pulp.

OUTER HIMALAYA and the DŪN, in shady places or ravines. — Rámgarh, Mohkumpur, Lachiwála, Mothronwála, Karwápáni, Timli Pass, etc.

Wood light-grey, strong and tough, but used only for fuel.

Fl. Jan.-June. Fr. Apr.-Nov.

2. **P. eriocarpum**, Royle; Fl. Br. Ind. i. 199; Brandis For. Flora 19.

A small tree with spreading branches; young parts brown-tomentose. *Leaves* 4-8 in. long, obovate or broadly oblanceolate, glabrate above, yellowish-tomentose beneath; petiole 7-12 in. long. *Flowers* pale-yellow, 3 in. long, in many-flowered umbellate corymbs. *Sepals* lanceolate, tomentose. *Petals* free, linear. *Capsules* 5 in. diam., felted-tomentose, tipped with the persistent style; valves woody; seeds many.

MUSSOORIE HILLS; above Rájpur in Kiárkuli forest, also at Sahansra-dhára, 3,600 ft.: Ámláwa valley in JAUNSAIR.

Wood used only for fuel.

Fl. Mar., Apr. Fr. May-July.

ORDER 10. TAMARISCINEÆ; G. P. N. 24.

Shrubs or small trees. *Leaves* alternate, minute, often scale-like, exstipulate. *Flowers* regular, usually 2-sexual, in simple or paniced spikes or racemes. *Sepals* and *petals* often 5 each, imbricate, free or connate below. *Stamens* 5, 10, or indefinite, inserted on a glandular disk; anthers versatile. *Ovary* with 3-5 carpels. *Fruit* a capsule dehiscing into 3-5 valves. *Seeds* hairy or winged.

1. *Tamarix*, Linn.; G. P. n. 1.

1. **T. dioica**, Roxb.; Fl. Br. Ind. i. 249; Brandis For. Flora 21; Gamble Man. Ind. Timb. 19. Vern. *Jháu*, *Lál Jháu*, Hind.

A gregarious shrub; bark reticulately cracked. *Leaves* minute, sheathing, acuminate, green with white margins. *Flowers* dioecious, light rose-coloured. *Sepals* and *petals* free; bracts acuminate, with a sheathing base, as long as the flowers. *Stamens* 5. *Capsules* oblong, 2 in. long.

Along open streams in the DŪN, such as the Sòng and Suswá rivers; also in the ráus of the SAHÁRANPUR SIWALIKS, and at Bishenpur and other places along the Ganges.

Wood red and moderately hard, but used chiefly for fuel. Weight about 50 lbs. per c. ft.

Fl. May-July, Fr. Cold season,



11. HYPERICINEÆ.

[*Hypericum*.

CSL

ORDER 11. HYPERICINEÆ ; G. P. N. 26.

Herbs or shrubs. *Leaves* opposite, entire, gland-dotted, exstipulate. *Flowers* regular, 2-sexual, usually cymose, terminal or axillary. *Sepals* usually 5, imbricate. *Petals* as many as the sepals, contorted in bud. *Stamens* indefinite, 3-5-adelphous, rarely free or monadelphous; anthers versatile. *Ovary* 1-3-5-celled; ovules numerous, generally on axile placentas; styles 3-5, filiform, united. *Fruit* a septicidal capsule. *Seeds* numerous, exalbuminous.

1. *Hypericum*, Linn. ; G. P. n. 2.

Herbs or shrubs. *Leaves* usually sessile. *Flowers* cymose. *Petals* yellow, usually oblique.

Analysis of the Species.

Flowers large; styles twice the length of the ovary. 1. *H. cernuum*.
Flowers small; styles as long as the ovary . . . 2. *H. patulum*.

1. ***H. cernuum***, Roxb.; Fl. Br. Ind. i. 253. Vern. *Ping-nidrá*, *Phinli*, Jaunsar; *Piuli*, Málköt.

A glabrous shrub. *Leaves* 1-3 by ½-1 in., decussate, sessile, elliptic or ovate-lanceolate, entire, minutely dotted, glaucous beneath; tip acute or rounded. *Flowers* 2 in. diam., bright golden-yellow, 3-5 in a short terminal cyme. *Petals* obovate, longer than the stamens. *Styles* 5-8 in. long, spreading. *Capsules* conical, 3-5 in. long.

Throughout JAUN SAR and the OUTER HIMALAYA, 5,-8,000 ft., often on rocks.—Korwá, Kathián, Málköt, etc.

Fl. Apr., May.

2. ***H. patulum***, Thunb. ; Fl. Br. Ind. i. 254.

A shrub. *Leaves* distichous, ½-1½ in. long, narrow-rhomboid or elliptical, very shortly petioled, black-dotted and rusty beneath; margins reflexed. *Flowers* 1 in. diam. *Sepals* 2 in. *Petals* yellow, orbicular or elliptical, longer than the stamens. *Styles* equalling the ovary but exceeding the stamens. *Capsules* obtusely conical, 2-3 in. long.

HILLS of MUSSOORIE and JAUN SAR at 5,-7,000 ft., in shady ravines, sometimes on rocks.

Fl. Apr., May.



12. TERNSTROEMIACEÆ.

CSL

ORDER 12. TERNSTROEMIACEÆ ; G. P. N. 28.

Shrubs or trees. *Leaves* alternate, simple, exstipulate, usually coriaceous. *Flowers* regular, generally showy and 2-sexual, usually subtended by a pair of bracts. *Sepals* and *petals* 5 each, imbricate, the latter sometimes connate below. *Stamens* numerous, hypogynous, free or connate at the base, often adnate to the petals. *Ovary* usually 3-5-celled, rarely many-celled; ovules 2 or many in each cell, on axile placentas; styles as many as the cells, free or connate. *Fruit* a berry or a capsule. *Seeds* few or many; albumen scanty or 0.

Analysis of the Genera.

Erect shrubs or trees.

Leaves smooth, evergreen; flowers white, on simple pedicels.

Flowers small, dioecious; fruit a berry.

Flowers large, 2-sexual; fruit a capsule.

Leaves rough, deciduous; flowers usually pink, paniced.

Climbing shrubs; flowers white, cymose; fruit a

fleshy berry.

1. *Eurya*, Thunb.; G. P. n. 12.

1. *E. acuminata*, DC.; Fl. Br. Ind. i. 285; Gamble Man. Ind. Timb. 28. Syn.—*E. japonica*, Thunb. (partly); Brandis For. Flora 24.

An evergreen shrub with brown smooth bark; branchlets terete; young parts generally hairy. *Leaves* 2-4 by 5-8 in., oblong-lanceolate, acuminate, closely crenate-serrulate, coriaceous, usually glabrous above; midrib depressed above, hairy beneath; lateral nerves indistinct; petiole very short. *Flowers* white, small, dioecious, about 5 together in the axils of the leaves; pedicels short, 2-bracteolate. *Sepals* 5, concave, pubescent outside. *Petals* 5, white, alternating with and exceeding the sepals, 1 in. long, more or less united below. *Stamens* 12-15, shorter than the petals. *Fruit* globose, of the size of a peppercorn, crowned by the remains of the styles.

OUTER HIMALAYA, 3-7,000 ft.: Málköt Hills; Mussoorie. Also low valley in the HILLS, e.g., Bámsu, Kulni, etc.

Wood reddish-brown, close-grained, moderately hard.

Fl. Nov., Dec.



12. TERNSTRÆMIACEÆ.

[*Actinidia*.]

2. *Actinidia*, Lindl. ; G. P. n. 14.

1. *A. callosa*, Lindl. ; Fl. Br. Ind. i. 286.

A climbing shrub ; stems brown, white-warted. *Leaves* 3-5 by 2-3 in., broadly elliptic, acuminate, serrulate ; lateral nerves 6-8 pairs ; petiole 1-2·5 in. *Flowers* white, ·5 in. diam., polygamous or dioecious, in lax umbellate axillary cymes. *Sepals* 5, oblong, obtuse, tomentose. *Petals* 5, contorted-imbricate. *Stamens* many. *Ovary* hairy, many-celled ; styles numerous, elongated after flowering. *Fruit* a fleshy ovoid berry, ·8 in. long, edible.

Valleys below MUSSOORIE and in DEHRA DÚN (Mr. P. W. Mackinnon). Very scarce.

Fl. June. Fr. Sept.

3. *Saurauja*, Willd. ; G. P. n. 15.

1. *S. napaulensis*, DC. ; Fl. Br. Ind. i. 286 ; Brandis For. Flora 25 ; Gamble Man. Ind. Timb. 29. Vern. *Ratendú*, Jaunsar ; *Joginá*, Hind.

A small tree sparingly branched ; bark reddish-brown ; young parts and inflorescence covered with long tapering stiff brown hairs. *Leaves* approximate at the ends of the branches, 7-14 by 2·5-4 in., oblong or oblanceolate, acute or short-acuminate, acutely serrate, rusty-tomentose beneath, especially when young ; lateral nerves numerous, parallel, prominent ; petiole 1-1·5 in., rough. *Flowers* pink, ·5 in. diam., in lax drooping axillary panicles ; bracts imbricate. *Sepals* small, fleshy. *Petals* pink, usually connate at the base ; margins fimbriate. *Stamens* many ; anthers dehiscing by pores. *Fruit* fleshy, green, 5-lobed, with a mealy sweet pulp. *Seeds* reddish-brown, small.

Damp valleys in the HILLS, 3-5,000 ft. : Mayargádh below Jádi. Tons Valley, Garugádh, Sansáru Khálá, etc.

Wood light-pink, soft, spongy. The ripe fruit is eaten.

Fl. Apr., May. Fr. May, June.

4. *Camellia*, Linn. ; G. P. n. 24.

1. *C. theifera*, Griff. ; Fl. Br. Ind. i. 292. Syn.—*C. Thea*, Link ; Brandis For. Flora 25 ; Gamble Man. Ind. Timb. 31. The Tea plant. Vern. *Chá* or *Cháh*, Hind.

A large evergreen shrub. *Leaves* 3-6 by 1-2·5 in., elliptic-oblong, acute or acuminate, serrate, usually coriaceous, glabrous above, slightly pubescent along the nerves beneath ; petiole ·15 in. *Flowers* 1-1·5 in. diam., axillary, solitary or a few together on short peduncles ; bracts 2-3, sepal-like. *Sepals* 5, leathery, concave, more

or less pubescent, edges ciliate. *Petals* white, .5-.7 in. long, broadly obovate, slightly coherent at the base. *Stamens* numerous, cohering at the base, adherent to the base of the petals. *Ovary* 3-5-celled. *Fruit* a loculicidal capsule, .7-.9 in. diam., leathery; seeds few, pale-brown.

Largely cultivated in plantations in the DÚN.

Fl. Dec.-Mar. Fr. Sept.-Dec.

ORDER 13. DIPTEROCARPEÆ; G. P. N. 29.

Usually resinous trees. *Leaves* alternate, simple, entire, penninerved; stipules usually small and early deciduous. *Flowers* regular, 2-sexual, in panicles. *Calyx* gamosepalous, campanulate, free or adnate to the ovary, 5-lobed; 2 or more of the lobes usually accrescent in fruit. *Petals* 5, twisted. *Stamens* 5-15 or indefinite, hypo- or peri-gynous, free connate or adnate to the petals; anthers with an aristate connective. *Ovary* slightly immersed in the torus, usually 3-celled. *Fruit* capsular or nut-like, usually winged with the variously enlarged calyx-lobes. *Seed* usually exalbuminous; cotyledons fleshy.

1. *Shorea*, Roxb.; G. P. n. 8.

1. *S. robusta*, Gartn.; Fl. Br Ind. i. 306; Brandis For. Flora 26; Gamble Man. Ind. Timb. 34. The Sál tree. Vern. Sál, Hind.

A large tree, deciduous but seldom quite leafless; bark of young trees blackish-brown, smooth or with a few longitudinal cracks, marked with minute grey specks; of old trees very thick, dark-grey, rough with irregular furrows. *Leaves* 4-12 by 2-7 in., ovate-oblong, acuminate, tough, thinly coriaceous, glabrous and shining when fully mature; lateral nerves 12-15 pairs, those near the apex very slender; base cordate or rounded; petiole terete, .5-.8 in. long; stipules .3 in. long, pubescent, caducous. *Flowers* subsessile, in large lax terminal or axillary racemose panicles, covered with white pubescence. *Calyx-tube* short, adnate to the torus; segments ovate, all accrescent in fruit. *Petals* pale-yellow, about .5 in. long, narrow-oblong or lanceolate, much exceeding the calyx-segments in flower. *Stamens* up to 50, many times shorter than the petals; connective subulate, bearded. *Ovary* 3-celled; style subulate. *Fruit* .5 in. long, ovoid, acute, rather fleshy, indehiscent, white-pubescent; wings 5.



13. DIPTEROCARPEÆ.

CSL
[*Shorea*.]

2-3 in. long, spatulate, narrowed at the base, brown when dry, somewhat unequal, with 10-12 straight, parallel nerves.

The principal tree of the DÚN and SIWALIKS and in the forests of SAHÁRANPUR, ascending to 4,000 ft. in the SIWALIKS and in the OUTER HILLS of MÁLKÔT, MUSSOORIE and JAUNSAIR, everywhere remarkably gregarious. "In the NEPAL TERAI, the sál tree attains 100-150 ft. with a clear stem to the first branch of 60-80 ft., and a girth of 20-25 ft."—*Sir D. Brandis*. In the School Circle, however, it is seldom more than 80 ft. in height and 6 ft. in girth, unless hollow inside. The sapwood is whitish, not durable. The heartwood is brown, cross-grained, hard, and very durable; weight when fully seasoned 50-60 lbs. per c. ft. It seasons very badly and warps and splits in drying. For building purposes, however, it is the strongest and most important timber of Northern India. The tree yields, when tapped, a large quantity of a white opaline resin which is burnt as an incense, being considered indispensable as such in certain Hindu religious ceremonies, and is also used to caulk boats and ships. An oil is extracted from the fruit, which is used for burning and to adulterate ghee. The fruit is also ground into flour and eaten by the poorer classes during times of scarcity.

New leaves and Fl. Mar., Apr. Fr. June, July.

ORDER 14. MALVACEÆ; G. P. N. 31.

Herbs, shrubs, or soft-wooded trees; bark with mucilaginous juice and tenacious fibre; young parts mostly covered with stellate hairs. *Leaves* alternate, stipulate, simple lobed or digitately compound, usually palminerved. *Bracteoles* 3 or more, often forming an epicalyx. *Flowers* regular, generally 2-sexual, axillary or terminal, solitary fascicled or cymosely paniced. *Sepals* 5, more or less connate, valvate in bud. *Petals* 5, hypogynous, twistedly imbricate. *Stamens* generally indefinite, monadelphous, rarely pentadelphous; anthers 1-celled, bursting longitudinally. *Ovary* syncarpous; carpels generally numerous; ovules attached to the inner angle of each carpel. *Styles* more or less connate; stigma various. *Fruit* a loculicidal capsule, or of dry cocci. *Seeds* sometimes with silky hairs; albumen scanty or 0.

Analysis of the Genera.

- Leaves simple ; bracteoles 4-6 ; seeds naked . . . 1. KYDIA.
Leaves digitate ; bracteoles 0 ; seeds woolly . . . 2. BOMBAX.

1. *Kydia*, Roxb. ; G. P. n. 19.

1. *K. calycina*, Roxb. ; Fl. Br. Ind. i. 348 ; Brandis For. Flora 29 ; Gamble Man. Ind. Timb. 43. Vern. *Pulá, Púli, Puli* Hind.

A moderate-sized deciduous tree ; bark grey, exfoliating in long strips, rough with large white specks on branches ; young parts covered with grey stellate hairs. *Leaves* 4-6 in. diam., rounded, cordate, palmately 5-7-nerved, generally with as many lobes or angles as nerves, glabrate or with scattered hairs above, downy and pale beneath ; petiole about half the length of the blade. *Flowers* 5-7 in. across, polygamous, generally dioecious, in much-branched axillary or terminal panicles. *Bracteoles* 4-6, accrescent and spreading in fruit. *Calyx* campanulate, 5-lobed, accrescent. *Petals* white, clawed, adnate to the staminal tube, longer than the calyx. *Stamens* monadelphous ; the tube shorter than the petals and split half way into 5 segments, each bearing at the apex 3-5 sessile anthers. *Carpels* 3 ; style 3-left. *Capsule* subglobose, 3-valved ; seeds reniform, furrowed.

Very common in the DÚN and SAHÁRANPUR FORESTS, also in valleys in the HILLS at low elevations.

Wood white, soft, used only for fuel ; weight 40-45 lbs. per c. ft. The tree is of little value except as a help to reproduction in blanks and glades. The bark is often used for tying up bundles of faggot in the forest. "In North India it is employed for the clarification of sugar."—Sir D. Brandis.

Leafless Feb.-Apr. Fl. July-Oct. Fr. Dec.-Feb.

2. *Bombax*, Linn. ; G. P. n. 42.

1. *B. malabaricum*, DC. ; Fl. Br. Ind. i. 349 ; Brandis For. Flora 30 ; Gamble Man. Ind. Timb. 44. The Silk-cotton tree. Vern. *Semal, Simal*, Hind.

A large deciduous tree. *Stem* straight, more or less buttressed at the base when old, covered with large conical prickles when young ; branches whorled, horizontally spreading. *Leaves* digitate ; common petiole 6-12 in. long. *Leaflets* 5-7, 6-9 by 3-5 in., lanceolate oblanceolate or obovate, acuminate, entire, more or less coriaceous, glabrous ; petiolule 1 in. long ; stipules small, caducous. *Flowers* 4-5 in. across, fleshy. *Calyx* very fleshy, cup-shaped, bright silky-hairy inside. *Petals* crimson or orange, 3-6 in. long, oblong, white-tomentose outside. *Stamens* usually 5-adelphous ;



14. MALVACEÆ.

[Bombay.]

filaments numerous, the innermost forked. Ovary 5-celled; style 5-lobed at the apex. Capsule 5-7 in. long, oblong-ovoid, 5-angled. Seeds obovate, smooth, surrounded by long white silky hairs.

Common in the DÚN and SAHÁBANPUR DISTRICTS ascending to 4,000 ft. in the OUTER HIMALAYA and in valleys in the HILLS, generally affecting water-logged places, e.g., the Pathri forest, SAHÁBANPUR DIVISION, and Nakraunda, Jogiwála, and dry beds of the Sông in the DÚN.

The wood is very soft and perishable, but durable under water; weight 17-32 lbs. per c. ft. It is used for planking, packing cases, toys, well-curbs and water-shoots. The calyx of flowers not yet fully open is eaten cooked as a vegetable. The cotton is used to stuff pillows and cushions. The seed is valued as a nourishing food for cattle which also greedily devour the flowers. The roots of saplings are used as a nervine tonic in native medicine.

Fl. Jan.-Mar. Fr. Apr., May.

There are several shrubs or undershrubs, either wild or cultivated, belonging to this Family which deserve mention. Among these are —

i. Cultivated plants.—

1. *Gossypium herbaceum*, Linn. } Fl. Br. Ind. i. 346, 347;
 2. " *barbadense*, Linn. } The cotton plants,—
- which are easily recognized by the large leafy bracteoles and the white cotton surrounding the seeds. Vern. *Kapás*, Hind.—*G. P. n.* 39.

3. *Hibiscus esculentus*, Linn.; Fl. Br. Ind. i. 343. The Okra. Vern. *Bhindi*. The tender fruit is used as a vegetable.—*G. P. n.* 34.

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|--|-------|--|
| 4. <i>Hibiscus Rosa-sinensis</i> , Linn. | Vern. | } Fl. Br. Ind. i. 344. These are common garden plants in the Dún with large showy flowers. |
| <i>Javá</i> , Hind. | | |
| 5. " <i>mutabilis</i> , Linn. | Vern. | |
| <i>Gul-i-ajáib</i> , Hind. | | |
| 6. " <i>seriacus</i> , Linn. | Vern. | |
| <i>Gurhal</i> , Hind. | | |

ii. Wild plants.—

1. *Sida carpinifolia*, Linn. }
2. " *rhombifolia*, Linn. } Fl. Br. Ind. i. 323, 324.
- Vern. *Kharenti*, Dún. } Leaves narrow, not lobed. Flowers yellow.
3. " *cordifolia*, Linn. } —*G. P. n.* 16.
4. *Abutilon indicum*, } Fl. Br. Ind. i. 326 and 328; Vern.
- G. Don*. } *Tepári*, Hind. Leaves cordate,
5. " *ramosum*, } hairy. Flowers yellow, opening
- Guill. & Perr. } in the evening.—*G. P. n.* 21.

These are all weeds of roadside, forest-glades or waste places but yield a fibre which will probably be found of value in the future.

5. *Urena lobata*, Linn., Fl. Br. Ind. i. 329. Vern. *Ūṅā*, Dún. Noticeable for its pink flowers and barbed capsules which attach themselves on to clothes. The stem gives a useful fibre. Leaves about 3 in. across, 5—7-lobed.—G. P. n. 25.

6. *Thespesia Lampas*, Dalz. & Gibs.; Fl. Br. Ind. i. 345. Vern. *Ban Kapási*, Dún. It is a common undershrub in glades in Sál forests, easily recognized by its large bright yellow flowers with a crimson centre which appear during the rains. Leaves 4-6 in. diam., 3-lobed, cordate; petiole 2-3 in. long. Capsule ovoid, 1 in. long, erect, generally infested with a bug of the Lygæidæ family. The plant yields a strong white fibre, and the flower is likely to give a useful dye.—G. P. n. 37.

ORDER 15. STERCULIACEÆ; G. P. N. 32.

Herbs, shrubs, or trees, usually with soft wood; young parts generally tomentose; bark mucilaginous and with strong fibres. Leaves alternate, simple and lobed, or digitate, usually stipulate. Flowers generally regular, 1- or 2-sexual, often bracteate, in axillary or terminal cymes or panicles, rarely solitary or fascicled. Calyx usually gamosepalous; segments 5. Petals 5 or none. Stamens usually monadelphous, with 5, 10, or 15 2-celled anthers. Ovary stipitate or sessile, free, 2-5-celled, apocarpous or syncarpous. Fruit a loculicidal capsule, or of distinct follicular carpels. Seeds attached to the inner angle of the carpels, sometimes arillate.

Analysis of the Genera.

- | | |
|---|-----------------|
| Flowers 1-sexual or polygamous; petals none;
(fruit of distinct carpels) | 1. STERCULIA. |
| Flowers 2-sexual; petals 5, deciduous. | |
| Ovary stipitate; fruit of distinct twisted
carpels. | 2. HELICTERES. |
| Ovary sessile; fruit a 5-valved capsule. | 3. PTEROSPERMUM |

1. Sterculia, Linn.; G. P. n. 1.

Trees or shrubs. Leaves simple and lobed, or digitate. Flowers polygamous. Calyx tubular, often

coloured. *Staminal column* bearing a ring of sessile anthers. *Carpels* 5, more or less distinct and follicular, usually on a long gynophore, opening long before ripening. *Seeds* one or more in each carpel, often winged or arillate.

Analysis of the Species.

- Leaves sharply lobed ; follicles woody. . 1. *S. villosa*.
Leaves obscurely lobed ; follicles membranous. 2. *S. pallens*.

1. ***S. villosa***, Roxb. ; Fl. Br. Ind. i. 355 ; Brandis For. Flora 32 ; Gamble Man. Ind. Timb. 46. Vern. *Godgudāla*, Hind.

A moderate-sized deciduous tree with grey bark ; branches few, spreading ; branchlets stout. *Leaves* approximate at the ends of the branches, 9-18 in. diam., cordate, nearly glabrous above, tomentose beneath, deeply 5-7-lobed ; lobes ovate-oblong, acuminate, entire toothed or cleft ; petiole 12-24 in. long, hollow, downy outsides, stipules lanceolate, deciduous. *Flowers* yellow, in much-branched rusty-pubescent drooping panicles which are crowded at the ends of the leafless branches ; male flowers the most numerous ; bracts linear ; caducous. *Calyx* campanulate, pinkish within, downy outside. *Anthers* inserted on a membranous ring which is adnate to the short gynophore. *Ovary* globose. *Fruit* follicular ; follicles 1.5-2.5 in. long, oblong, spreading, coriaceous, rusty villous, red within ; seed black.

Fairly common in the DŪN and SAHĀRANPUR FORESTS, also at Kālsī, generally on sandy or gravelly soil.

Wood very soft and light, about 20 lbs. per c. ft., of no use. The inner bark yields a coarse strong fibre which is made into ropes, and is used, either twisted or in broad bands, in dragging timber. A white clear gum exudes from cuts made in the bark which is used medicinally, and is sold in the bazaar under the name of *katāla*.

Leafless Jan.-May. Fl. Mar., Apr. Fr. June, July.

2. ***S. pallens***, Wall. ; Sir G. King's Flora of the Malayan Peninsula 182. Syn.—*S. fulgens*, Wall. (partly), Fl. Br. Ind. i. 360. Vern. *Khardāla*, Mālkōt.

A middle-sized tree with yellowish-grey smooth bark. *Leaves* 8-12 in. diam., obscurely lobed, coriaceous, scabrid above, covered with dense pale-yellow stellate tomentum beneath ; petiole 8-15 in. long, pubescent. *Flowers* 5-7 in., in erect panicles, pale-yellow, very downy all over, caducous. *Calyx* cylindrical, curved ; teeth ovate, acute. *Follicles* membranous, stipitate, opening long before maturity, rather scarce.

MÁLKÔT HILLS, below **MUSSOORIE**, Tháno forest in the **DŪN**, and **Saia** in **JAUNSAAR**; -2,200 to 5,000 ft. Also in shady ravines in the **SIWALIKS**, e.g., **Timli** and **Mohand Passes**.

Economic uses similar to those of *S. villosa*.

Fl. Mar., Apr. Fr. May, June.

2. *Helicteres*, Linn.; G. P. n. 10.

1. **H. Isora**, Linn.; Fl. Br. Ind. i. 365; Brandis For. Flora 34; Gamble Man. Ind. Timb. 49. Vern. *Maror-phal*, Hind.; *Kapási*, **Saháranpur**.

A shrub with thin spreading branches and grey bark; young parts covered with stellate hairs. *Leaves* 3-6 by 2-4 in., bifarious, broad-obovate or orbicular, often lobed, obliquely cordate or rounded at the base, short-acuminate, irregularly toothed, scabrous above, pubescent beneath; petiole 2-4 in. *Flowers* 1-2 in. long, axillary, usually 2 or 4 together, bracteate; pedicels 2-5 in. *Calyx* tubular, 6-8 in. long, indistinctly 2-lipped, brown-floccose outside. *Petals* 5, scarlet, clawed, twice the length of the calyx, reflexed, the two lower ones much larger than the rest; claws winged. *Staminal column* adnate to the gynophore; anthers 10, on short filaments; staminodes 5, scale-like. *Ovary* 5-celled, on a gynophore which is elongated in fruit; styles 5, much exserted, more or less connate. *Fruit* 1-5-2 in. long, cylindrical, pubescent, composed of 5 spirally twisted carpels; seeds tubercled.

A very common shrub in the **DŪN** and **SAHÁRANPUR FORESTS**, especially in coppice areas, generally gregarious; rather scarce in **Sál forests**.

The branches are used for fencing and thatch-frames, and the bark yields a strong white fibre. The fruit and leaves are used in native medicine.

Fl. Apr.-Aug. Fr. Cold season.

3. *Pterospermum*, Schreb.; G. P. n. 11.

1. **P. acerifolium**, Willd.; Fl. Br. Ind. i. 368; Brandis For. Flora 35; Gamble Man. Ind. Timb. 49. Vern. *Máyeng*, **Jaunsar**.

A large tree with thin grey smooth bark; young branches covered with ferruginous tomentum. *Leaves* 6-12 by 5-10 in., roundish or oblong, often lobed, entire or remotely toothed, deeply cordate or peltate, coriaceous, glabrous and deep-green above, grey-pentose and strongly reticulate beneath, palmately 8-10-nerved and the tip of the petiole; lateral nerves 4-6 pairs; petiole 3-6 in.



15. STERCOULIACEÆ. [*Pterospermum*].

long, striate; stipules multifid, caducous. *Flowers* axillary, solitary or in 2-3-flowered cymes, 5-6 in. diam., fragrant, bracteate; pedicels 5 in. long. *Calyx* 5-cleft; segments valvate, 3-5 by .3-.5 in., linear, fleshy, floccosely brown-tomentose outside, villous within. *Petals* twistedly imbricate, linear, pure white, slightly shorter than the calyx, membranous, deciduous. *Filaments* 15, 1-1.5 in. long, filiform, in threes opposite to each sepal with a staminode 2-3 in. long between; the whole staminal whorl forming a tube about 1 in. long below the ovary and adnate to the gynophore; anthers 15; cells linear, .5 in. long. *Ovary* oblong, 5-angled, inserted on the top of the staminal column; style undivided, club-shaped. *Fruit* a capsule, 4-6 in. long, 5-celled, 5-angled, woody, dark-brown, tomentose. *Seeds* compressed, with large brown membranous wings.

Banks of the Jumná from below Mussoorie to its junction with the Tons, and the Ámláwa valley up to near Saíá. Very common in the swampy forests of the EASTERN DÚN about Khairi and Sidhár-wála. Frequently cultivated in DEHRA.

Growth quick. Sapwood white; heartwood soft or moderately hard, red; weight about 48 lbs. per c. ft. The leaves are lopped for cattle-fodder, and are laid on roofs underneath thatch or slate in Jaunsar; the down of the leaves is used for tinder and to stop bleeding from wounds. A plaster made of the calyx is considered infallible in glandular swellings about the neck and ears.

Fl. Mar.-June. Fr. Cold season.

P. lanceafolium, Roxb.; Fl. Br. Ind. i. 368, is a handsome tree cultivated in gardens at DEHRA, and is found wild in the hills of KUMAON. *Leaves* lanceolate. *Flowers* 1 in. long. *Fruit* 2-3 in. long, woody.

ORDER 16. TILIACEÆ; G. P. N. 33.

Trees, shrubs, or herbs; bark usually mucilaginous and with strong fibre. *Leaves* usually alternate, simple or lobed; stipules free. *Flowers* regular, generally bisexual. *Sepals* 3-5, free or connate, valvate. *Petals* as many as the sepals, free, rarely absent. *Stamens* usually indefinite, free or connate. *Ovary* free, 2-10-celled; styles columnar, or parted into as many divisions as there are cells in the ovary; placentation axile. *Fruit* a drupe or a capsule.



16. TILIACEÆ.

41

1. *Grewia*, Linn. ; G. P. n. 8.

Trees or shrubs, more or less stellate-pubescent. *Leaves* alternate, usually distichous, often inequilateral, variously toothed, with 3-7 basal nerves. *Flowers* 2-sexual, axillary, solitary cymose or paniced. *Sepals* 5, distinct, coriaceous, coloured inside. *Petals* 5, usually glandular at the base, sometimes wanting. *Stamens* indefinite, free, all fertile, inserted on a raised torus when the petals are glandular. *Ovary* 2-4-celled. *Fruit* a drupe, more or less fleshy, entire or lobed ; lobes 1- or more-seeded.

Analysis of the Species.

- Peduncle generally one, leaf-opposed ; leaves scaberulous. 1. *G. oppositifolia*.
 Peduncles generally more than one, axillary.
 Leaves oblong or ovate, more or less cordate.
 Drupe fleshy, under 5 in. diam. ; leaves softly hairy beneath.
 Trees ; peduncles scarcely exceeding the petioles.
 Stipules leafy, falcate, auriculate. 2. *G. tiliifolia*
 Stipules linear or subulate.
 Buds cylindrical or clavate, ribbed. 3. *G. asiatica*.
 Buds ovoid, not ribbed 4. *G. vestita*.
 An undershrub ; peduncles many times longer than the petioles 5. *G. sapida*.
 Drupe crustaceous, about 1 in. diam. ; leaves scabrous. 6. *G. scabrophylla*.
 Leaves lanceolate, never cordate.
 Leaves glabrescent ; drupe rugose, 2-lobed, black when ripe. 7. *G. lœvigata*.
 Leaves velvety beneath ; drupe shining, smooth, 4-lobed, whitish when ripe. 8. *G. polygama*.
 1. *G. oppositifolia*, Roxb. ; Fl. Br. Ind. i. 384 ; Brandis For. Flora 37 ; Gamble Man. Ind. Timb. 54. Vern. *Biul*, *Biur*, *Jaunsar* ; *Bewal*, *Bhimal*, *Dûn* ; *Behel*, *Sahâranpur*.
 A moderate-sized tree with whitish bark. *Leaves* 3-6 by 1.5-3 in., broadly ovate-lanceolate, acuminate, obtusely but closely serrate, scabrous above, pubescent beneath ; base unequally rounded, usually 3-nerved (occasionally 3-6-nerved) ; cross-veins transverse and straight ; petiole 2-5 in. ; stipules subulate, caducous. *Flowers*



in leaf-opposed umbellate cymes, rarely axillary or terminal; buds cylindrical, pilose. *Sepals* linear, '6-1 in. long, 3-ribbed, red and smooth inside. *Petals* linear, shorter than the sepals, white or yellow. *Drupe* 1-4-lobed, fleshy, dark-green, black when ripe, rough with scattered stiff white hairs.

Fairly common in the DÚN, e.g., Tháno, Lachiwála, Phán-dowála, Ámbári, etc.; more so along the foot of the SAHÁRANPUR SIWALIKS and in the Pathri forest. Also found in JAUNSAK up to 6,000 ft., often cultivated about villages: Saiá, Dálmigádh, Tons valley, etc.

It reaches about 40 ft. in height, with a short trunk and a spreading crown. Wood white, weighing 45-50 lbs. per c. ft. It is unpleasantly scented, and is therefore seldom used for fuel. Being tough and elastic, it is used for oar-shafts, axe-handles, banghy-poles, bows, etc. The inner bark yields a fibre which is used for rope and paper-making, and the leaves are much valued for fodder, especially in the hills. The ripe fruit is eaten.

Fl. Apr.-June, and occasionally in winter in the Saháranpur forests. Fr. Oct.-Dec.

There seem to be two forms if not two varieties, grouped under this,—one represented by the SAHÁRANPUR tree with white petals, and the other by the HILL one which has yellow petals.

2. *G. tiliaefolia*, Vahl; Fl. Br. Ind. i. 386; Brandis For. Flora 41; Gamble Man. Ind. Timb. 54. Vern., Dháman, Hind.

A small tree with a short trunk; crown spreading. *Leaves* 3-5 by 2-4 in., obliquely ovate or orbicular or pentagonal-rhomboid, cordate, acuminate, dentate, hoary-pubescent or glabrescent beneath; basal nerves generally 5, petiole '7-1'2 in. long, slender but thickened at the top; stipules leafy, falcate, often transverse, acuminate. *Peduncles* axillary, 3-10 together, '5-1 in. long, each with 3-6 short bracteolate pedicels; flower-buds ellipsoidal, more or less ribbed. *Sepals* linear, '2-3 in. long, pubescent outside, glabrous inside. *Petals* oblong, half the length of the sepals. *Drupe* blackish, globose, the size of peppercorns, entire or very distinctly and equally 2-lobed.

EASTERN SIWALIKS and the DÚN;—Rámgarh, Mothronwála, etc.; very scarce.

Wood brown, hard and tough, used for cart-shafts, axe-handles banghy-poles, etc. Weight about 48 lbs. per c. ft.

Fl. Apr., May. Fr. July-Oct.

3. *G. vestita*, Wall.; Brandis For. Flora 40; Gamble Man. Ind. Timb. 55. Syn.—*G. asiatic* var. *vestita*, Wall.; Fl. Br. Ind. i. 387. Vern. Dháman, Hind.

A tree with grey bark; branches and young plants with large white blotches. *Leaves* 3-5 by 2-3'5 in., obliquely ovate, generally

Not cordate, acuminate, minutely serrate, sometimes obscurely 3-lobed, pale and softly downy beneath, especially when young; basal nerves 5-6; petiole generally not exceeding .5 in.; stipules linear. *Flowers* in densely crowded (rarely solitary) axillary cymes; peduncles .3-.4 in. long, hairy, bearing 2-3 bracteolate pedicels; buds ovoid, .15-.2 in. long, not ribbed. *Sepals* slightly pubescent and yellow inside. *Petals* yellow, much shorter than the sepals. *Drupe* globose, .2-.3 in. diam., sometimes indistinctly 2-4-lobed, dark-brown or black when ripe.

A very common tree in both the Sál and mixed forests of the DÚN and SAHÁRANPUR DIVISIONS, extending to the SIWALIKS and to the OUTER HIMALAYAN slopes and low-level valleys in JAUNSAIR.

Wood grey, tough, elastic, hard and close-grained, used for banghy-poles, bows, spear-handles, etc. Weight about 50 lbs. per c. ft. The branches are lopped for fodder, and the fruit is eaten. The bark yields a strong white fibre.

Fl. Apr.-June. Fr. Aug.-Nov.

Recent investigations carried out by Mr. Duthie have proved *G. elastica*, Royle, to be quite distinct from *G. vestita*, Wall. In the former, the innovations are dark rusty-tomentose, the petals not glandular at the base, and the leaves very frequently lobed. It occurs only in the HILLS; e.g., above Thadiár.

4 *G. asiatica*, Linn.; Fl. Br. Ind. i. 386; Brandis For. Flora 40; Gamble Man. Ind. Timb. 55. Vern. *Phálsá*, *Phálsá-Dháman*, Hind.

A small or moderate-sized tree; bark dark-grey or greenish-white, longitudinally wrinkled; young parts brown-pubescent. *Leaves* 4-6 by 3-5 in., obliquely ovate or orbicular, closely and irregularly serrate, densely brown-tomentose beneath; base 5-7-nerved, more or less cordate; petiole .5-1 in., densely rusty-tomentose, thickened at the top, rather stout; stipules, linear or subulate. *Peduncles* generally 2-3, rarely more or solitary, usually shorter than or as long as the petioles; pedicels 2-3, somewhat shorter than the peduncles; buds cylindrical or clavate, generally distinctly ribbed, softly woolly. *Sepals* .3-.4 in. long, oblong-lanceolate, rusty-floccose outside, orange and glabrous inside. *Petals* oblong, yellow, half the length of the sepals. *Drupe* globose, about .4 in. diam., not or indistinctly 2-lobed, pilose, dark-brown when ripe.

Two distinct forms of this plant are met with:—1. a stunted tree with a short trunk, straggling branches and short-petioled more or less orbicular hard leaves, more common about Rámgarh in the DÚN; and 2. a middle-sized tree with a large spreading crown and long-petioled somewhat soft ovate leaves, found along the foot of the SAHÁRANPUR SIWALIKS, especially at Beribará, and in the Tons



16. TILIACEÆ.

[*Grewia*.]
CSL

and Amlāwa valleys in JAUNSAK. It is cultivated in gardens for the fruit.

Wood similar to that of *G. vestita*, and is used for the same purposes. The sweetmeat-makers of Sahāranpur use the mucilaginous bark to clarify sugar. The fruit is eaten.

Fl. Apr., May. Fr. June-Aug.

5. *G. sapida*, Roxb.; Fl. Br. Ind. i. 387; Brandis For. Flora 41. Vern. *Bistā*, Jaunsar; *Phālsā*, Hind.

A prostrate undershrub with a perennial woody rootstock throwing out annually a number of switchy shoots, which, after bearing leaves, flowers and fruit, are burnt or browsed down to be renewed next year. *Leaves* 2-4 by 1·5-3 in., ovate obovate or orbicular, usually doubly serrate, sometimes obscurely lobed, pilose or scabrid above, pubescent beneath; petiole 2-3 in. long; stipules linear. *Flowers* axillary; peduncles 2-5 together, 7-12 in. long, slender, each 2-5-flowered; buds oblong. *Sepals* oblong, 2-3 in. long, reddish-brown inside. *Petals* yellow, half the length of the sepals, entire. *Drupe* the size of a pea, slightly lobed.

Open grass-lands up to 3,500 ft. Common in fire-traces and forest paths in the DŪN and SAHĀRANPUR DIVISIONS, also in low valleys in the HILLS, e.g. at Thadiār, Bāmsu, etc.

A favourite fodder plant. Fruit edible.

Fl. Apr., May. Fr. Oct., Nov.

6. *G. scabrophylla*, Roxb.; Fl. Br. Ind. i. 387 Syn.—*G. sclerophylla*, Roxb.; Brandis For. Flora 39. Vern. *Gúrbbheli*, Dún.

A small shrub 5 to 6 ft. high, apt to be mistaken for a young *Helicteres Isora*, which it somewhat resembles in foliage. *Leaves* 4-7 by 3-4 in., ovate or obovate, acuminate, irregularly serrate, coriaceous, scabrous above, pubescent beneath; basal nerves 3-5; petiole 5-7 in. long; stipules subulate. *Flowers* 7 in. long, white; buds ribbed. *Sepals* pubescent, more than twice the length of the petals. *Petals* white, notched. *Drupe* about 8 in. diam., globose, slightly depressed, with a brown, crustaceous and scabrous rind and a scanty pale-yellow viscid sweetish pulp; stones 4.

Common in open grass lands in the DŪN and SAHĀRANPUR FORESTS. The stem yields a strong white fibre which can be made into ropes. Fruit edible.

Fl. Apr.-Sept. Fr. Nov.-Mar.

7. *G. lævigata*, Vahl; Fl. Br. Ind. i. 389; Brandis For. Flora 42. Vern. *Kath Bhemal*, *Phirsau*, Dún.



A small tree; bark dark-brown. *Leaves* 3-5 by 1·3-2 in., tapering at both ends, acuminate, serrate, glabrescent or with a few scattered hairs, 3-nerved; transverse veins fine; petiole ·5 in. long; stipules linear, caducous. *Flowers* axillary; peduncles 2-3 together, longer than the petiole, each 2-3-flowered. *Sepals* about 1 in. long, 3-ribbed. *Petals* white, about one-fourth the length of the sepals, entire. *Style* longer than the stamens. *Drupe* ·3 in. diam., 1-4-lobed, rugose, black when ripe.

Throughout the DŪN in shady localities and in ravines; also in the western half of the SAHĀRANPUR DIVISION, and valleys in the HILLS.

The leaves are lopped for fodder.

Fl. June-Sept. Fr. Cold season.

8. *G. polygama*, Roxb.; Fl. Br. Ind. i. 391; Brandis For. Flora 42.

A shrub with a short trunk and bifarious spreading branches. *Leaves* 2-3 in. long, narrow-lanceolate, sharply serrate, nearly glabrous above, white-tomentose beneath. *Flowers* polygamous, mostly 1-sexual, on slender axillary peduncles. *Stigma* stellate. *Drupe* ·5 in. diam., whitish-brown, shining, sometimes with a few scattered hairs.

In blanks throughout the DŪN and SAHĀRANPUR FORESTS, chiefly with sāl; also in grass-lands. Pathri forest. Particularly common in the SIWALIK tracts.

The leaves are browsed by cattle.

Fl. July, Aug. Fr. Nov., Dec.

To this Family belongs *Corchorus olitorius*, Linn.; Fl. Br. Ind. i. 397;—which is one of several annual plants of the same Genus, from which the 'jute' fibre is obtained. *Stem* 8-12 ft. high. *Leaves* 3-4 in. long, ovate-lanceolate, long-petioled. *Flowers* yellow. *Fruit* an elongated capsule, 2 in. long, 10-ribbed. It is found in DEHRA, and also in large quantity in the Pathri forest, SAHĀRANPUR DIVISION. The very light soft wood is used for country-made sulphur matches.
—G. P. n. 18.

DISCIFLORÆ.

ORDER 17. LINEÆ; G. P. N. 34.

HERBS or shrubs. *Leaves* usually alternate, simple, entire, rarely crenate. *Flowers* regular, 2-sexual, usually 5-merous. *Sepals* quite entire. *Petals* contorted in bud,



17. LINEÆ.

[*Reinwardtia*.]

rugacious, each with a gland inside near the base, adnate to the staminal ring. *Stamens* 5, often alternating with minute staminodes, connate at the base into a tube or ring. *Ovary* 3-5-celled; style 3-5, more or less free. *Fruit* a capsule, splitting into 3-6 cocci.

1. *Reinwardtia*, Dumort.; G. P. n. 3.

1. *R. trigyna*, Planch.; Fl. Br. Ind. i. 412. Vern. *Basant*, Dún; *Pengún*, Jaunsar.

A glabrous undershrub, 2 to 3 ft high or occasionally higher. *Leaves* 1-4 in. long, narrow-oblong or oblanceolate, narrowed into a slender petiole, usually entire and mucronate, membranous. *Flowers* about 1 in. long, in axillary or terminal cymes or panicles, sometimes solitary. *Sepals* 5, green, lanceolate, acuminate. *Petals* 5, bright-yellow, obovate, about 1 in. long. *Styles* usually 3, more or less connate below. *Capsule* the size of a pea, papery.

Very common in the DÚN and the HILLS up to 6,000 ft., growing fairly large if not too much browsed.

Fl. Feb.-Apr. Fr. Apr.-June.

ORDER 18. MALPIGHIACEÆ; G. P. N. 36.

Climbing or suberect shrubs. *Leaves* opposite, simple, entire, usually exstipulate. *Flowers* regular, or irregular, bisexual, pentamerous, white or yellow, in axillary or terminal panicles. *Calyx* deeply 5-partite, usually with a large gland outside. *Petals* free. *Stamens* 10, hypogynous, equal or unequal; filaments free or connate below. *Ovary* free, 3-celled, 3-lobed; cells 1-ovuled. *Fruit* of 1-3 samaras. *Seeds* exalbuminous.

Analysis of the Genera.

Calyx glandular; style 1; carpels winged at the end.	1. HIPTAGE.
Calyx eglandular; styles 3; carpels winged all round.	2. ASPIDOPTERYS.

1. *Hiptage*, Gærtn. ; G. P. n. 34.

1. **H. Madablota**, Gærtn. ; Fl. Br. Ind. 148 ; Brandis For. Flora 44. Vern. *Anetá*, Dún ; *Madh Málti*, Hind.

A large evergreen climbing shrub. *Leaves* 4-6 by 1·5-2·5 in., oblong- or ovate-lanceolate, acuminate, entire, coriaceous, glabrous ; main lateral nerves 4-6 pairs, arcuate ; base acute, rarely rounded ; petiole 2-5 in. long ; stipule 0. *Flowers* showy, fragrant, in large terminal and smaller axillary panicles. *Calyx* with a large oblong gland outside ; segments 2 in. long, imbricate, pubescent. *Petals* 5-7 in. long, unequal, silky, clawed, fimbriate, 4 white, 1 yellow. *Stamens* 10, one much larger than the rest. *Style* 1, filiform. *Fruit* of 1-3 samaras ; wings 3, obovate or oblanceolate, one large about 2 by 5 in., two small about 1 by 2 in.

Common in ravines and moist places in the Dún, e.g., the Bindál nála, Kuáwála, Nakraunda, Nágsidh, Karwápáni, etc. ; also at Kálsi.

The woody stem is used for fuel.

Fl. Feb.-Apr. Fr. May, June.

2. *Aspidopterys*, A. Juss. ; G. P. n. 37.

1. **A. Wallichii**, Hook. f. ; Fl. Br. Ind. i. 421. Syn. — *A. nutans*, A. Juss. ; Brandis For. Flora 45. Vern. *Jugtér*, Málkót.

A climbing shrub ; branches slender, white-pubescent. *Leaves* usually opposite,* sometimes in whorls of three, 3·5 by 2·5-3·5 in., ovate oblong or orbicular, acuminate, glabrescent above, white-tomentose beneath ; main lateral nerves 4-5, arcuate ; base subcordate or rounded ; petiole 5-7 in. long. *Panicles* large, pendulous, terminal but running down among the leaves below so as to appear partly axillary ; pedicels rather stout, with very minute bracteoles. *Flowers* white or cream-colour, about 2 in. across. *Calyx* glandular, minute. *Petals* 5, equal, entire, not clawed, 3 or 4 times the length of the calyx. *Stamens* 10, all fertile. *Ovary* white-tomentose. *Fruit* of 1-3 samaras ; wings variable usually orbicular-oblong, 1-1·5 in. long ; nucleus without crest or wing.

Hedges and open forest lands throughout the Dún and SAHÁ-RANPUR DIVISIONS, and the OUTER HIMALAYA ;—very conspicuous in fruit.

Fl. Aug., Sept. Fr. Nov., Dec.

Very similar in appearance, but with larger and less tomentose leaves which are not cordate, larger panicles and somewhat larger flowers—is *Aspidopterys nutans*, Hook. f. ; Fl. Br. Ind. i. 421, Syn.—*A. lanuginosa*. A. Juss. ; Brandis For. Flora 44,—occurring in much the same localities. Common towards Ráipur in the Dún.

* There is a specimen in the School Herbarium with leaves distinctly alternate, which is quite exceptional in the Family.



19. *RUTACEÆ*.

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ORDER 19. *RUTACEÆ* ; G. P. N. 39.

Trees or shrubs, rarely herbs, usually aromatic. *Leaves* alternate, compound, rarely opposite or simple, exstipulate, usually with translucent glandular dots. *Flowers* regular, in cymes corymbs or panicles, rarely solitary. *Calyx* of 4-5 small lobes. *Petals* as many as the calyx-lobes, usually hypogynous. *Stamens* as many or twice as many as the petals, rarely more, with an annular or cylindrical disk within; anthers 2-celled, often versatile. *Ovary* of 4-5 free or connate carpels; styles 1-5, usually free. *Fruit* a berry, less frequently capsular or drupaceous.

Analysis of the Genera.

Armed.

- | | |
|--|-----------------|
| Scandent shrubs; fls. polygamous; style 1. | 2. TODDALIA. |
| Erect shrubs or trees. | |
| Flowers 1-sexual; styles 2-5; fruit of capsular carpels. | 1. ZANTHOXYLUM. |
| Flowers 2-sexual; style 1; fruit a berry. | |
| Leaves 3-foliolate or imparipinnate; pericarp fleshy. | 6. LIMONIA |
| Leaves 1-foliolate; pericarp leathery. | 9. CITRUS. |
| Leaves 3-foliolate; pericarp woody. | 10. ÆGLE. |

Unarmed.

- | | |
|---|----------------|
| Flowers polygamous; petals valvate. | |
| Trees. Leaves 1- (rarely 3-) foliolate, thin, slightly scented. | 3. ACRONYCHIA. |
| A small shrub. Leaves simple, fleshy, strongly scented | 4. SKIMMIA. |
| Flowers 2-sexual; petals imbricate. | |
| Leaves 1-5-foliolate; style persistent. (Flowers paniced; filaments subulate) | 5. GLYCOSMIS. |
| Leaves imparipinnate; style deciduous. | |
| Flowers corymbose or solitary; filaments linear-subulate. | 7. MURRAYA. |
| Flowers usually in terminal panicles; filaments dilated below. | 8. CLAUSENA. |

1. *Zanthoxylum*, Linn.; G. P. n. 51.

1. *Z. alatum*, Roxb.; Fl. Br. Ind. i. 493; Brandis For. Flora 47; Gamble Man. Ind. Timb. 60. Vern. *Timbūr*, *Timrū*, *Temrū*, Jaunsar; *Tejbal*, Hind.

A shrub or small tree with corky bark, and strong prickles on the branches, petioles and midrib of the leaflets; branchlets often rough with raised grey specks. *Leaves* alternate, imparipinnate, common petiole and rachis narrowly winged. *Leaflets* 2-6 pairs, opposite, sessile, 1-3 by 3-8 in., elliptic-lanceolate, more or less serrate, obtusely acuminate, pellucid-punctate. *Flowers* small, yellow, usually 1-sexual, in dense lateral panicles. *Calyx* 6-8-fid. *Petals* none. *Stamens* 6-8, much exceeding the calyx; anthers large. *Fruit* usually of a solitary carpel which dehisces ventrally, of the size of a peppercorn, tubercled, strongly aromatic.

Hot valleys and in forest undergrowth up to 6,000 ft. in JAUNSAR, TEHRI-GARHWAL and the OUTER-HIMALAYA. Above Rājpur; Dhārmigādh, Tons and Bāmsu valleys; Korwā, Koti forest, etc.

Wood close-grained, heavy, hard, and of a yellow colour (whence the generic name), used for walking-sticks. Tooth-brushes are made of the branchlets, which and also the aromatic fruit are good for toothache. The fruit is also used as a condiment and to purify water. The bark is used to intoxicate fish.

Fl. Apr.-June. Fr. Aug.-Oct.

2. *Toddalia*, Juss.; G. P. n. 62.

1. *T. aculeata*, Pers.; Fl. Br. Ind. i. 497; Gamble Man. Ind. Timb. 61. Vern. *Kānj*, Hind.

A large prickly scandent shrub, even old stems bearing curved prickles with a large conical corky base. *Leaves* alternate, usually 3-foliate. *Leaflets* sessile, 2-4 by 7-15 in., obovate, elliptic or oblanceolate, crenulate, glabrous, more or less coriaceous, with many straight lateral nerves. *Flowers* polygamous, in axillary cymes or less frequently in terminal panicles, 2 in. diam., pale-yellow. *Calyx* usually 5-lobed, pubescent outside. *Petals* 5, imbricate. *Stamens* generally 5, longer than the petals in the male flowers, imperfect or 0 in the female flowers; anthers round. *Ovary* 5-celled. *Fruit* globose, the size of a large pea, shallowly 5-grooved or -lobed; seeds reniform.

In swampy places or deep open ravines in the Dūn, e.g., Kāluwāla, Nakraunda, Mothronwāla, Bindāl nālā, etc.



19. RUTACEÆ.

[*Toddalia*]

The bark of the roots gives a yellow dye, and a bitter aromatic tonic which is used as a remedy for fever.

Fl. Feb.-Apr. Fr. July-Sept.

3. *Acronychia*, Forst.; G. P. n. 67.

1. *A. laurifolia*, Blume; Fl. Br. Ind. i. 498.

A tree. *Leaves* usually 1-foliolate, subopposite or crowded at the ends of the branches. *Leaflets* variable, 3-6 by 1.5-3 in., elliptic, oblong, obovate or oblanceolate, quite entire, glabrous, sometimes obtusely acuminate, more or less aromatic; base acute; lateral nerves, 12-15 pairs; petiolule .5-1 in. long. *Cymes* axillary, trichotomous, corymbose; peduncles 3-4 in. long, slender. *Flowers* whitish, fragrant; buds oblong. *Calyx* 4-lobed; lobes small, rounded. *Petals* 4, valvate, 2 in. long, oblong, with a broad base, more or less villous inside. *Stamens* 8, alternately longer; filaments subulate, bearded below. *Ovary* 4-celled, hairy, sunk in the disk. *Fruit* a drupe, .3-4 in. diam., slightly lobed or grooved; seeds black.

Occurs but rarely in the DŪN.—Mothronwála swamp.

Wood white, fine- and close-grained, but liable to crack; weight about 42 lbs. per c. ft. Old stems sometimes with irregular patches of brown mottled harder wood inside, which however is not the true heartwood.

Fl. May-July. Fr. Nov.-Jan.

4. *Skimmia*, Thunb.; G. P. n. 68.

1. *S. Laureola*, Hook. f.; Fl. Br. Ind. i. 499; Brandis For. Flora 50; Gamble Man. Ind. Timb. 61. Vern. *Kathúr-chará*, *Guripathá*. Jaunsar.

A strongly aromatic small evergreen shrub; bark white. *Leaves* 4-6 by .8-1.5 in., alternate, simple, oblong, oblanceolate or obovate, acute or acuminate, coriaceous, rather succulent, quite entire, glabrous, gland-dotted, crowded at the ends of the branches; midrib stout; nerves indistinct; petiole .1-3 in., flattened above. *Flowers* polygamous, yellow, .3-5 in. diam., in compact terminal panicles. *Calyx* 4-5-lobed, imbricate. *Petals* 4-5, oblong, valvate. *Stamens* 4-5, hypogynous; filaments stout, subulate. *Ovary* 2-5-celled; style 1. *Fruit* an ovoid or subglobose fleshy drupe, .5-7 in. long, red when ripe, with 2-5 1-seeded stones.

A common undershrub in shady localities in the HILLS 6-10,000 ft., generally in dense gregarious patches. "The odour of the musk-deer *Kastúra* is popularly supposed to be derived from it."

—*Mr. A. Smythies*.

Fl. Apr., May. Fr. July-Sept.

5. **Glycosmis, Correa**; G. P. n. 71.

1. **G. pentaphylla**, Correa; Fl. Br. Ind. i. 499; Brandis For. Flora 49; Gamble Man. Ind. Timb. 59. Vern. *Ban Nimbū*, Hind.

A small evergreen shrub. *Leaves* alternate, usually 3-5-foliate; petiole and rachis stout. *Leaflets* very variable in size and shape, usually 4-6 by 1.5-2 in., ovate, lanceolate or obovate, entire or obscurely crenulate, dark-green, quite glabrous. *Flowers* white, fragrant, in axillary or terminal panicles. *Calyx* 4-5-fid; segments broad. *Petals* 4-5, white, imbricate. *Stamens* 8-10, free; filaments dilated below. *Ovary* 2-5-celled; style short, persistent. *Fruit* a globose or depressed berry, pink or bluish-white when ripe, with an aromatic sweetish pulp.

Forms a thick undergrowth in shady moist evergreen forests in the DŪN, e.g., Khairi, Kānsráo, Nakraunda and Káluwála; also at Kálsi.

The wood is tough and hard, but is seldom found of a utilizable size. It makes a good hedge-plant, for which purpose it is often planted. The twigs are used as tooth-sticks. The ripe fruit is eaten, and the roots are used in native medicine.

Fl. and Fr. throughout the year.

6. **Limonia, Linn.**; G. P. n. 75.

1. **L. acidissima**, Linn.; Fl. Br. Ind. i. 507; Brandis For. Flora 47; Gamble Man. Ind. Timb. 59. Vern. *Beli*, Hind.

A large spinous shrub or small tree with white or ash-coloured corky bark. *Leaves* alternate, imparipinnate, 3-6 in. long; petiole and the rachis between each two pairs of leaflets winged to the size and shape of leaflets. *Leaflets* 5-9, 5-1.5 in. long, quite sessile, ovate-rhomboid or ovate-lanceolate, acuminate, crenulate, gland-dotted; base cuneate. *Flowers* 4-merous, white, fragrant, in short axillary often leaf-bearing racemes. *Calyx* 4-partite, small. *Petals* 4, elliptic or oblong, much larger than the calyx-segments. *Stamens* 8, inserted round an annular or columnar disk. *Ovary* 4-celled; cells 1-ovuled; style short, deciduous. *Fruit* a globose berry, 3-4 in. diam., fleshy, black when ripe, exceedingly acid (whence the specific name).

Common in the EASTERN DŪN and western half of the SAHÁBANPUR SIWALIKS: Tháno, Lachiwála, Barkálá, etc.

Wood cream-coloured, hard and close-grained, capable of employment as a substitute for box-wood, but chiefly used for fuel; walking-sticks are made of the branches. "The pulp of the fruit is considered protective against contagion, and an antidote to venomous poisons"—Sir D. Brandis.

Fl. Apr., May. Fr. Cold season.

7. *Murraya*, Linn.; G. P. n. 76.

Unarmed shrubs or small trees. *Leaves* alternate, imparipinnate. *Leaflets* alternate, petioluled. *Flowers* 2-sexual, cymose or corymbose. *Calyx* 5-fid. *Petals* 5, imbricate. *Stamens* 10, the alternate shorter; filaments subulate; anthers short. *Ovary* 2-5-celled; style simple, long, articulated, deciduous. *Fruit* a berry.

Analysis of the Species.

An evergreen shrub; leaflets 3-9; fruit red when ripe. 1. *M. exotica*.
A deciduous shrub; leaflets 9-25; fruit black when ripe. 2. *M. Koenigii*.

1. *M. exotica*, Linn.; Fl. Br. Ind. i. 502; Brandis For. Flora 48; Gamble Man. Ind. Timb. 61. Vern. *Bilgár*, Dún; *Márchulá*, Garhwal.

An evergreen shrub or small tree with thin grey corky bark. *Leaves* dark-green, glabrous, 3-8-foliolate. *Leaflets* 1-3 by 5-1 in., obliquely rhomboid, more or less acuminate, entire, shining above, coriaceous when mature; petiolule 1 in. long. *Flowers* 1 in. long, white, very fragrant, in terminal or axillary corymbs, sometimes solitary. *Sepals* minute, acute, dotted. *Petals* oblong-lanceolate. *Ovary* linear, 2-celled. *Berries* 5-7 in. long, narrowed at both ends, 2-seeded, rugose, red or deep-orange when ripe.

Cool shady ravines in the DÚN and OUTER HILLS, and along ráus in the SAHÁRANPUR SIWALIKS.

Wood close-grained, hard, light-yellow, capable of being used for wood-engraving; weight 62 lbs. per c. ft. Handles of implements and walking-sticks are made of it, and the twigs are used for tooth-brushes. It is often planted as an ornamental shrub.

Fl. Mar.-Sept. but often throughout the year. Fr. Oct.-Feb.

2. *M. Koenigii*, Spreng.; Fl. Br. Ind. i. 503; Brandis For. Flora 48; Gamble Man. Ind. Timb. 61. Vern. *Gandhelá*, Dún; *Káth Nim*, Hind.

A deciduous shrub with thin dark-brown bark. *Leaves* 6-12 in. long; rachis terete, pubescent. *Leaflets* 10-25, 1-2 in. long, ovate or lanceolate, oblique at the base, obtusely acuminate or retuse, subentire or irregularly crenulate; petiolule 1 in. *Flowers* 3-5 in. long, white, in terminal corymbose panicles. *Sepals* small, acute. *Petals* oblong, dotted. *Ovary* 2-celled. *Fruit* subglobose, 3 in. diam., rugose, black when ripe.



A common undershrub in the DÚN and SAHÁRANPUR FORESTS, generally in ravines and on waste lands. Often gregarious under Khair and Sissu in dry beds of streams in the DÚN, e.g., near Kánsráu.

Wood even-grained, hard and durable, capable of being used for agricultural implements. The fresh leaves have a fetid smell, but give an agreeable flavour to curries, and are much used for this purpose in Southern India.

New leaves Mar., Apr. Fl. Apr., May. Fr. Cold season.

8. *Clausena*, Burm.; G. P. n. 77.

1. *C. Wampi*, Blanco; Fl. Br. Ind. i. 505. Vern. *Am-ptch*, Dún.

A sweet-scented evergreen tree. *Leaves* alternate, imparipinnate; petiole and rachis terete. *Leaflets* 5-9, 3-5 by 1.7-3 in., ovate elliptic or lanceolate, oblique, shining above, margins wavy or crenulate; petiolule .2-.3 in. long. *Flowers* 2-sexual, small, white, 4-5-merous, in large compound terminal panicles; inflorescence rusty-tomentose. *Calyx* 4-5-fid. *Petals* 4-5, imbricate, concave. *Fruit* a 1-seeded globose drupe, .6-.8 in. diam., with a tough glandular rind.

Cultivated in the DÚN for its fruit and as an ornamental plant, and perhaps also growing wild.

Fl. Mar., Apr. Fr. June, July.

C. pentaphylla, DC.; Fl. Br. Ind. i. 503. Vern. *Ratanjöt* Hind.—is likely to occur in the SÁl forests of the EASTERN DÚN. It is a small undershrub with rough coriaceous pinnate leaves and large aromatic leaflets.

9. *Citrus*, Linn.; G. P. n. 81.

1. *C. medica*, Linn.; Fl. Br. Ind. i. 514; Brandis For. Flora 51. The Lemon or Lime. Vern. *Nimbú*, Hind.

A shrub or small tree with strong axillary spines; bark greenish-grey, smooth. *Leaves* 1-foliolate; petiole .3-.5 in. long, often winged. *Leaflets* 3-6 by 1.2-5 in., elliptic or ovate-lanceolate, entire or more or less serrate, coriaceous, glabrous. *Flowers* often 1-sexual, .5-1 in. long, white, sweet-scented, in axillary cymes or solitary; pedicels .3-.5 in. long, stout. *Calyx* cup-shaped, 3-5-toothed or entire. *Petals* 4-8, imbricate, .6-.8 in. long, oblong, fleshy, with large glandular dots, often tinged pink outside. *Stamens* 20-40, round a large disk; filaments variously connate. *Ovary* many-celled; ovules 4-6 in each cell; style deciduous; stigma lobed. *Fruit* 2-4 in. long, ovoid oblong or globose,



19. RUTACEÆ.

[*Citrus*.]

with a thick or thin rind which is generally yellow when ripe; pulp cellular and juicy, usually acid.

Indigenous in damp localities in the DÚN, e.g., Nakraundá, Káluwála, Jogiwála, etc. Several varieties with acid or sweet juice are cultivated in gardens. The wood is tough and close-grained, and makes good walking-sticks.

Fl. Apr., May. Fr. Nov., Dec.

The following species are also cultivated in gardens in the DÚN :—

1. *C. Aurantium*, Linn.; Fl. Br. Ind. i. 515.—The Orange. Vern. *Nárengi*, Hind., of which there are several varieties, distinguishable from *C. medica* by pure-white 2-sexual flowers, and the characteristic colour and shape of the fruit.

2. *C. decumana*, Linn.; Fl. Br. Ind. i. 516. The Shaddock or Pumelo. Vern. *Chakutará*, Hind., a tree with large leaves. pubescent beneath; petiole broadly winged. Flowers large, white, strongly scented. Fruit 6-8 in. diam., globose or pyriform.

10. *Ægle*, Correa; G. P. n. 83.

1. *A. Marmelos*, Correa; Fl. Br. Ind. i. 516; Brandis For. Flora 57; Gamble Man. Ind. Timb. 63. The Bael tree. Vern. *Bel*, *Bill*, *Bael*, Hind.

A glabrous deciduous tree with grey corky bark and sharp straight axillary spines about 1 in. long. Leaves alternate, 3-foliolate, with a resinous odour; common petiole 1-2.5 in. long, terete. Leaflets 2-4 by 1-2.5 in., ovate-lanceolate or rhomboidal, acuminate, crenate, gland-dotted, lateral sessile or with a petiolule about .1 in. long; terminal petiolule .5-1 in. long, flattened above. Flowers greenish-white, about 1 in. diam., sweet-scented, in short lateral panicles. Calyx small, obscurely 4-5-toothed, pubescent, deciduous. Petals 4-5, imbricate, oblong, gland-dotted. Stamens numerous; filaments short, subulate, often fascicled; anthers long, narrow. Ovary 8-20-celled; ovules many in each cell; style short; stigma deciduous. Fruit 2-7 in. diam., with a smooth grey or yellow woody rind, and a mass of sweet yellow aromatic mealy pulp.

Common in the EASTERN DÚN and SAHÁRANPUR SIWALIKS, e.g., Rikhikesh, Lachiwála, Ránipur, etc. Often cultivated for its fruit, and as a sacred tree.

Wood even and close-grained, tough and strong, but liable to split badly in seasoning; weight 50-60 lbs. per c. ft. It is used

in construction. The pulp of the ripe fruit is a laxative, and mixed with a little milk and sugar makes a very agreeable cooling sherbet. The unripe fruit, either boiled or roasted, is used as a specific for diarrhoea and dysentery. The pulp is also used to strengthen mortar. The mucus with which the cells of the fruit are filled is used for adhesive purposes, and is often mixed with water-paints to add to their strength and brilliancy. Snuff-boxes are made of the shell of the fruit. The leaves are very bitter and are used as a febrifuge; they are also lopped for cattle-fodder. They are considered as indispensable for the worship of the god *Shiva*, and the wood is one of the few that are prescribed by the Hindu scriptures for sacrificial fires.

Fl. Mar.-May. Fr. Mar.-June (next year).

ORDER 20. SIMARUBEÆ; G. P. N. 40.

Trees or shrubs with bitter bark. *Leaves* alternate, pinnate, usually exstipulate. *Flowers* small, regular, generally unisexual. *Calyx* 3-5-lobed, valvate or imbricate. *Petals* 3-5. *Disk* entire or lobed, rarely 0. *Stamens* as many or twice as many as the petals, hypogynous, inserted at the base of the disk; filaments free. *Ovary* 1-6-celled, usually deeply lobed or with distinct carpels.

1. *Picrasma*, Blume; G. P. n. 12.

1. *P. quassioides*, Bennett; Fl. Br. Ind. i. 520; Brandis For. Flora 59; Gamble Man. Ind. Timb. 64. Vern. *Karúi*, *Tithái* Jaunsar.

A large shrub with bitter bark; branches few, stout, usually with white specks. *Leaves* lyrate imparipinnate, 9-15 in. long, rusty-tomentose. *Leaflets* 9-15, generally 3-4 by 1-1.5 in., the lowest pair smallest and the penultimate pair largest, sub-opposite, ovate or oblong-lanceolate, long-acuminate, serrate, membranous, nearly glabrous when mature; petiolule of lateral leaflets .05-.08 in. of the terminal leaflet, .5-1 in. long. *Flowers* 1-sexual or polygamous, .2 in. across, pale-green, in axillary panicles. *Calyx* 4-5-lobed. *Petals* 4-5, valvate, enlarged and coriaceous in fruit. *Stamens* 4-5; filaments with a thick hairy base; anthers versatile. *Fruit* a drupe .2-.3 in. diam., black when ripe.



OUTER HIMALAYA above Rajpur, also in shady ravines in JAMNAR and TEHRI-GARHWAL, 5,800 ft.: Bámnaigádh, Mundáli; Deotá; banks of the Rúpin, etc. Not very abundant.

Wood cream-colour, light, fine and close-grained. The bark has the same properties as quassia, and is used as a tonic in native medicine.

Fl. Apr.-June. Fr. July-Sept.

ORDER 21. BURSERACEÆ; G. P. N. 42.

Resinous trees or shrubs. *Leaves* alternate, imparipinnate, usually exstipulate. *Flowers* regular, small, 2-sexual or polygamous. *Calyx* free, 3-6-lobed, often minute. *Petals* 3-6, usually distinct. *Disk* annular or cup-shaped, free or adnate to the base of the calyx. *Stamens* as many or twice as many as the petals; filaments free. *Ovary* 2-5-celled; ovules axile, 2-5 in each cell. *Fruit* usually a drupe, rarely dehiscent.

Analysis of the Genera.

Leaflets sessile; fruit 3-gonous, pericarp woody. 1. BOSWELLIA.
Leaflets petioluled; fruit globose, pericarp fleshy. 2. GARUGA.

1. *Boswellia*, Roxb.; G. P. n. 1.

1. **B. serrata**, Roxb.; Fl. Br. Ind. i. 528. Syn.—*B. thurifera*, Coleb.; Brandis For. Flora 61; Gamble Man. Ind. Timb. 66. Vern. *Salái*, *Salár*, Hind.

A gregarious deciduous tree; bark reddish-yellow or greenish-grey, smooth, peeling off in thin papery flakes; young parts pubescent. *Leave* exstipulate, pubescent, crowded at the end of the branches; rachis stout, 10-15 in. long. *Leaflets* 8-15 pairs (besides the odd one), sub-opposite, sessile or less frequently minutely petioluled, 2-3 by 3-6 in., lanceolate or linear, coarsely serrate, unequal-sided; tip rounded, sometimes mucronate. *Flowers* small, white, in axillary or sub-terminal fascicled racemes. *Calyx* 5-7-cleft. *Disk* annular, red, crenate. *Petals* 5-7, broad-ovate. *Stamens* 10; anthers hairy. *Ovary* 3-celled. *Drupe* 5-7 in. long, 3-gonous; carpels 1-seeded, at length separating septifragally; endocarp heart-shaped, bony, beaked, surrounded by a membranous wing.



Throughout the SAHÁRANPUR SIWALIKS, all by itself on steep sandy slopes, but in a mixed state on gentler slopes.

Sapwood large, rough-grained, soft and perishable, weight 20-35 lbs. per c. ft. An irregular-shaped mass of dark-brown mottled heavy wood is often found in the centre of large trees, which may be the heart-wood or perhaps a kind of ebony, quite capable of being used for ornamental purposes. The charcoal is used for iron smelting in the Central Provinces. A transparent gum-resin exudes from wounds and cracks in the bark, which is used in medicine, and also burnt as an incense.

Leafless Mar.-June. Fl. Apr., May. Fr. July, Aug.

2. *Garuga*, Roxb.; G. P. n. 3.

1. *G. pinnata*, Roxb.; Fl. Br. Ind. i. 528; Brandis For. Flora 62; Gamble Man. Ind. Timb. 66. Vern. *Kharpat*, Hind.

A large deciduous tree; bark grey or brown, exfoliating in hard round flakes, red inside. *Leaves* exstipulate, 9-15 in. long. *Leaflets* 5-9 pairs besides the terminal one, opposite, 2-4 by 1-1.5 in., oblong- or ovate-lanceolate, crenate, caudate-acuminate, more or less pubescent; petiolule 1-2 in. long. *Flowers* polygamous, yellow, in large terminal panicles; panicles 8-10 at the end of each branch, tomentose. *Calyx* campanulate, green; segments 5, valvate. *Petals* 5, linear, alternating with the calyx-segments. *Disk* large, clothing the calyx-tube. *Stamens* 10; filaments hairy. *Ovary* 4-5-celled, hairy. *Drupe* globose, 5-7 in. diam.

A very common tree in the DÚN and SAHÁRANPUR FORESTS generally with Sáil, but not uncommon in scrub forests and glades.

Wood soft, light and perishable, chiefly used for fuel. The leaves are lopped for camel-fodder. The tree can be easily propagated by cuttings, and is occasionally thus planted in hedgerows.

Leafless Dec.-Apr. Fl. Apr., May. Fr. Oct., Nov.

ORDER 22. MELIACEÆ; G. P. N. 43.

Trees or shrubs. *Leaves* alternate, exstipulate, usually pinnate, rarely 2- or 3-pinnate or simple; leaflets more or less oblique at the base. *Flowers* 2-sexual, regular, generally a large proportion sterile. *Calyx* 3-6-lobed. *Petals* 3-6, usually free. *Stamens* as many as the petals, or more frequently twice as many; filaments usually



22. MELIACEÆ.

[*Melia*.]

connate into a tube; anthers often sessile on the tube. Ovary free, 3-5-celled; style simple. Fruit a drupe or a capsule.

Analysis of the Genera.

- Stamens united into a tube; fruit a drupe; seeds not winged. 1. MELIA.
Stamens free; fruit a capsule; seeds winged. 2. CEDRELA.

1. *Melia*, Linn.; G. P. n. 7.

Handsome trees. *Leaves* pinnate or 2-3-pinnate. *Flowers* in large much-branched axillary panicles. *Calyx* 5-6-lobed, imbricate. *Petals* 5-6, free, convolute in bud. *Stamens* 10-12, monadelphous; the edge of the tube toothed; anthers inserted on or near the mouth of the tube. *Disk* annular. *Ovary* 3-6-celled; ovules two in each cell, one above the other; style slender; stigma capitate, deciduous. *Fruit* a dry or fleshy 1-5-celled drupe; seed solitary in each cell, pendulous.

Analysis of the Species.

- Leaves simply pinnate; drupe fleshy, 1-celled. 1. *M. indica*.
Leaves 2-or 3-pinnate; drupe dry, generally 5-celled. 2. *M. Azedarach*.

1. *M. indica*, Jussieu; Brandis For. Flora 67; Gamble Man, Ind. Timb. 69. Syn.—*M. Azadirachta*, Linn. Fl. Br. Ind. i. 544. The Neem tree. Vern. *Nim*, Hind.

A large handsome tree. *Leaves* imparipinnate, 9-15 in. long, glabrous. *Leaflets* 9-15, subopposite, 2-4 by '5-1 in., lanceolate or ovate-lanceolate, very unequal-sided, often falcate, deeply serrate, very gradually acuminate, bright-green and shining above, subsessile or with a minute petiolule. *Flowers* white, scented, in numerous axillary panicles which are shorter than the leaves; branches of panicles and pedicels very slender. *Calyx* small, flat; segments 5, rounded. *Petals* about '2 in. long, spatulate, ciliate. *Anthers* 10, inserted inside the staminal tube. *Ovary* 3-celled. *Drupe* '5-'7 in. long, ovoid-oblong, 1-celled, smooth, greenish-yellow when ripe.

Fairly common along the foot of the SAHÁRANPUR SIWALIKS and some distance in the interior, especially from Kasúri to Hardwar, unmistakably wild, if not indigenous. Cultivated for shade and ornament in the DÚN and SAHÁRANPUR DISTRICTS, as also throughout the greater part of India.



22. MELIACEÆ.

59

Sapwood grey; heartwood dark-red, very hard; weight about 50 lbs. per c. ft. It is used in construction and for furniture, and makes good sonorous drums. It is one of the woods held sacred by the Hindus, and idols are made of it. The bark, leaves and fruit are used in medicine. The fruit gives an oil which is considered very good for small-pox sores and is also used for burning. The leaves are much lopped for goat and camel fodder.

Fl. Mar., Apr. Fr. July, Aug.

2. **M. Azedarach**, Linn.; Fl. Br. Ind. i. 544; Brandis For. Flora 68; Gamble Man. Ind. Timb. 70. The Persian Lilac. Vern. *Bakām, Dék, Dáu; Deknoi*, Jaunsar.

A moderate-sized tree with smooth dark-grey bark. Leaves bipinnate, sometimes tripinnate, 9-18 in. long; pinnae usually opposite. Leaflets 3-7 in each pinna or pinnule, 5-1.5 in. long, ovate-lanceolate, serrate, acuminate, the lateral more or less oblique; petiolule 0.2 in. Flowers lilac-blue, in numerous axillary panicles; peduncles 3-4 in. long. Calyx deeply 5-lobed. Petals 5, 2-3 in. long, linear-oblancoate. Staminal tube purple, .2 in. long, cylindrical, with 20-30 linear teeth; anthers at the mouth of the tube. Ovary 5-celled. Drupe about .5 in. diam., globose, generally 5-celled and 5-seeded, more or less dry, yellow when ripe, at first quite smooth, afterwards wrinkled, remaining on the tree long after ripening.

Very common in cultivation in DEHRA DÚN and SAHÁRANPUR; also in hot valleys in JAUNSAAR, doubtfully wild.

The tree grows very fast and coppices extremely well. Heartwood reddish-brown, takes a good polish, and is sometimes used for furniture. "The bark is extremely bitter, and is employed as an anthelmintic. The fruit yields an oil, and the nuts are frequently strung as beads. The leaves and pulp of the fruit are used in native medicine."—*Mr. J. S. Gamble*. The leaves are also lopped for fodder.

Leafless Dec.-Mar. Fl. Mar.-May. Fr. Cold season.

2. **Cedrela**, Linn.; G. P. n. 35.

Deciduous trees. Leaves pinnate; leaflets opposite or subopposite. Flowers small, in large axillary and terminal panicles. Calyx small, 5-fid. Petals 5, imbricate, keeled inside at the base. Disk thick, 4-6-lobed. Stamens 4-6, free, inserted on the top of the disk; filaments subulate; anthers oblong, versatile. Ovary 5-celled; ovules 8-12 in each cell, in two series. Fruit



an oblong or ovoid capsule, septifragally 5-valved. *Seeds* numerous, flat, winged.

Analysis of the Species.

- Leaflets entire; panicles scarcely exceeding the leaves; seeds winged at both ends. . . . 1. *C. Toona*.
Leaflets serrate; panicles much exceeding the leaves; seeds winged only at the apex. . . . 2. *C. serrata*.

1. **C. Toona**, Roxb.; Fl. Br. Ind. i. 568; Brandis For. Flora 72; Gamble Man. Ind. Timb. 77. The Toon tree. Vern. *Tún*, Hind.

A large tree with a dense spreading crown and thin dark-grey bark which is smooth up to middle age. *Leaves* paripinnate, glabrous, generally 1-2 ft. long. *Leaflets* 8-30, generally opposite, 2-6 by 7-2·5 in., lanceolate or ovate-lanceolate, acuminate; margins entire, usually wavy; base acute, somewhat oblique; petiolule 3-7 in. long, slender. *Flowers* cream-coloured, scented like honey, in ample drooping panicles. *Calyx* short; lobes ciliate. *Petals* 15-2 in. long, free, oblong or ovate, ciliate. *Disk* hairy at the orange-coloured lobes. *Stamens* 5, inserted on the lobes of the disk. *Stigma* capitate, with a large depression at the apex. *Capsule* 7-1 in. long by 2-3 in. diam., oblong or oblan-ceolate, dark-brown. *Seeds* reddish-brown, light, with a membranous wing at either end, about 5 in. long, including the wings.

DÚN and SAHÁRANPUB FORESTS and valleys in the HILLS up to 3,500 ft., generally along banks of streams or in marshy localities, e.g. Káluwála, Rámgarh, Jogiwála; scarce with Sál. Largely planted in avenues, along canals, and in gardens.

Toon is a fast-growing species, attaining a girth of 60 inches in little more than 30 years. Trees 70-80 ft. in height and 8-10 ft. in girth are not at all uncommon. The heartwood is red, seasons well, takes a fine polish, and is easy to work. It is durable and is not eaten by white ants. Weight about 40 lbs. per c. ft. It is the chief furniture-wood of the School Circle. The leaves are sometimes lopped for fodder. A sulphur-coloured dye, *Basanti*, is extracted from the flowers. The bark has astringent properties, and is used in medicine.

Leafless Jan., Feb. Fl. Mar., Apr. Fr. June, July.

2. **C. serrata**, Royle; Brandis For. Flora 73, Gamble Man. Ind. Timb 79. The Hill Toon. Vern. *Darlú*, *Darli*, *Darloi*, Jaunsar.

A moderate-sized tree; bark with regular longitudinal fissures from very early age. *Leaves* usually imparipinnate, 2-3 ft. long. *Leaflets* 12-24 pairs, 3-8 by 1-2·5 in., ovate-lanceolate, acuminate, serrate,



23. OLACINEÆ.

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glaucous beneath when mature, very unequal-sided at the base; lateral nerves more or less straight; petiolule 1-2 in. long; rachis and midrib of leaflets red until fully mature; base of petiole much flattened. *Flowers* pink, often 6-merous, in lax drooping stringy panicles 3-5 ft. long (one of the largest inflorescences among Dicotyledons); pedicels rusty-tomentose. *Calyx* cup-shaped; lobes obtuse. *Petals* about 2 in. long, oblong, glabrous. *Disk* glabrous. *Stamens* alternating with sterile filaments. *Capsule* about 1 in. long by 5 in. diam., ovoid, acute, dark-grey. *Seeds* winged only at the upper end.

Valleys in JAUNSAH and TEHRI-GARHWAL ascending to about 8,000 ft.; Korwá, Binálgádh below Konáin, Dhárágádh, Tons valley, etc.

Wood light-red or flesh-colour. It is lighter (about 31 lbs. per c. ft.), coarser and more open-grained than that of Toon, from which it is further recognized by its fetid smell. It is used for bridges, for hoops of sieves, for sleepers of sledge-roads, for jhampán-poles and such other purposes. The leaves and young shoots are lopped for cattle-fodder.

Leafless Feb., Mar. Fl. May, June. Fr. July, Aug.

ORDER 23. OLACINEÆ; G. P. N. 45.

Trees or shrubs, sometimes climbing. *Leaves* usually alternate, simple, exstipulate. *Flowers* regular, small, 4-5-merous, 1- or 2-sexual, in cymes or racemes, rarely solitary. *Calyx* small, sometimes accrescent; lobes 0 or tooth-like and small, valvate or imbricate. *Petals* free or more or less coherent, usually valvate. *Stamens* 3-15, free or more or less monadelphous, all fertile or some reduced to staminodes; anthers 2-celled, splitting longitudinally. *Disk* usually hypogynous, cup-shaped. *Ovary* always 1-celled above, imperfectly 3-5-celled below; ovules pendulous from the apex of the central placenta; funicle dilated. *Style* simple or 0. *Fruit* drupaceous, 1-celled, 1-seeded; seed pendulous, albuminous.

1. *Olax*, Linn.; G. P. n. 5.

1. *O. nana*, Wall.; Fl. Br. Ind. i. 576; Brandis For. Flora 75; Gamble Man. Ind. Timb. 81.



23. OLACINEÆ.

[*Olar.*]

An undershrub with a woody rootstock from which annual shoots about 2 ft. high spring up during the rains; stems ribbed. *Leaves* alternate, 1·5-2·5 by 3·6 in., oblong-lanceolate, subsessile, glabrous and light-green above, glaucous beneath; margins recurved; midrib prominent beneath, straight; lateral nerves indistinct. *Flowers* solitary, 4 in. across; buds ovoid. *Calyx* minute, accrescent. *Petals* 3, oblong-lanceolate. *Fertile stamens* 3, opposite to the petals; staminodes 5-6, bifid, longer than the fertile stamens. *Ovary* 1-celled; style simple, terminal. *Fruit* the size of a pea, globular.

On crests of the SAHÁBANPUR SIWÁLIKs behind Ránipur; rather scarce.

Fl. Apr., May.

ORDER 24. ILICINEÆ; G. P. N. 46.

Trees or shrubs, generally evergreen. *Leaves* alternate, simple, glabrous, usually coriaceous. *Flowers* small, unisexual and often dioecious, in axillary fascicles or congested cymes. *Calyx* 3-6-cleft, persistent, imbricate in bud. *Petals* 4-5, white, imbricate, deciduous. *Stamens* 4-5, hypogynous, free or adnate to the petals. *Disk* 0. *Ovary* 3-16-celled; style short. *Fruit* a drupe with 3 or more 1-seeded stones. *Seeds* with a membranous testa.

1. *Ilex*, Linn.; G. P. n. 1.

Leaves coriaceous, serrate; midrib depressed above, prominent below. *Flowers* 4-5-merous. *Calyx* small. *Corolla* rotate; petals free or connate at the base. *Stamens* adhering to the base of the corolla. *Ovary* 2-12-celled; style very short or wanting. *Drupe* globose or ovoid, with 2-12 stones.

Analysis of the Species.

Leaves coriaceous, serrate.

Petiole not exceeding 3 in.; drupe with 2 stones . 1. *I. dipyrrena*.

Petiole up to 7 in.; drupe with 4 stones . 2. *I. odorata*.

Leaves membranous, entire.

(Petiole 5-1 in. long; drupe with 5 stones) . 3. *I. excelsa*.



24. ILICINÆ.

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1. **I. dipyrena**, Wall.; Fl. Br. Ind. i. 599; Brandis For. Flora 76; Gamble Man. Ind. Timb. 82. The Himalayan Bolly. Vern. *Kanderi*, Jaunsar.

A small evergreen tree with rough dark-grey bark. *Leaves* 3-5 by 1-1.7 in., elliptic, ovate or ovate-lanceolate, acute or acuminate, spinous-serrate on young plants, nearly entire on old trees, very coriaceous when fully grown; nerves indistinct; petiole .2-.3 in. long, channelled. *Flowers* .25 in. diam., whitish-green, tetramerous, in round axillary clusters, 2-bracteolate. *Calyx-lobes* broad-ovate, ciliate. *Petals* obovate, connate below in the male, free in the female flowers. *Ovary* small; stigma sessile. *Drupe* .3-.5 in. diam., globose or ellipsoid, red when ripe; stones usually 2, longitudinally grooved.

JAUNSAAR and TEHRI-GARHWAL, 5,-9,000 ft. Common about Chakrata and Deoban and elsewhere on limestone soils.

Wood white, hard and close-grained, but cracks in drying and is chiefly used for fuel.

Fl. Apr.-June. Fr. Aug.-Oct.

2. **I. odorata**, Ham.; Fl. Br. Ind. i. 599; Brandis For. Flora 77.

An evergreen tree; branches rather slender. *Leaves* 4-7 by 1.5-2.5 in., oblong-oblong-lanceolate or oblanceolate, acute or acuminate, very regularly and minutely serrate, thinly coriaceous; lateral nerves somewhat more distinct than in the last species; petiole .3-.7 in. long, channelled. *Flowers* small, white, 4-merous, bracteolate, in short axillary panicles. *Petals* of male flowers connate below, of female flowers free. *Stamens* much longer than the petals. *Ovary* globose, 4-celled; stigma sessile. *Drupe* .2 in. diam., globose, black; stones 4, trigonous.

OUTER HIMALAYA, e.g., below Mussoorie and the Málköt hills; also in the valley of the Tons in JAUNSAAR, 3,000-4,500 ft. Bháshla Block, Khunigádh, etc.

Fl. April. Fr. June.

3. **I. excelsa** (exsulca), Wall.; Fl. Br. Ind. i. 603; Brandis For. Flora 76; Gamble Man. Ind. Timb. 83. Vern. *Támari*, N.-W. P.

A middle-sized graceful evergreen tree; bark moderately smooth, silvery-white outside, yellowish and soft inside, with long horizontal wrinkles; young shoots pubescent. *Leaves* 2-4 by 1.25-2 in., elliptic, oblong or ovate, finely acuminate, entire, rather membranous, glabrous and dark-green above, finely grey-pubescent beneath when young, afterwards quite glabrous; lateral nerves about 8 pairs,



24. ILICINEÆ.

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[Her.]

acutate; base acute; petiole '5-1 in. long, channelled; stipules minute, caducous. *Flowers* 2-sexual, about '15 in. across, greenish-white, usually 5-merous, in 8-12-flowered axillary pubescent umbels; peduncles '3-7 in. long, compressed; pedicels about '1 in. long. *Calyx-lobes* ovate, ciliate. *Petals* ovate rotundate, recurved, united at the base. *Stamens* dilated at the base, as long as the petals, inserted on and alternating with them; anther-lobes ovate. *Stigma* sessile. *Drupe* globose, about '2 in. diam., with 5-3-sided stones.

JAUNSAE and TEHRI-GARHWAL, 4,6,000 ft.: Kiarigádh below Kathián, Mautárgádh, Lúnágádh, etc. Rather scarce.

Fl. May, June. Fr. Oct., Nov.

ORDER 25. CELASTRINEÆ; G. P. N. 47.

Trees, or erect or climbing shrubs. *Leaves* opposite or alternate, simple, usually coriaceous; stipules minute and caducous, or 0. *Flowers* 2-sexual or polygamous, generally cymose. *Calyx* small, 4-5-lobed, imbricate, persistent. *Disk* conspicuous, sometimes lobed. *Petals* 0 or 4-5, imbricate, inserted on the disk. *Stamens* 3-5, inserted on the disk, alternating with the petals and opposite to the calyx-lobes. *Ovary* 3-5-celled, surrounded by the disk; ovules usually 2 in each cell; style none or short. *Fruit* various. *Seeds* mostly arillate, sometimes winged.

Analysis of the Genera.

Fruit a capsule, seeds arillate.

Fruit lobed winged or echinate; leaves opposite.

1. EUONYMUS.

Fruit never winged or echinate, rarely lobed; leaves alternate.

2. CELASTRUS.

Fruit a drupe, seeds exarillate; (leaves subopposite.)

3. ELÆODENDRON.

1. Euonymus, Linn.; G. P. n. 1.

Trees or shrubs, the latter rarely scandent. *Leaves* opposite; stipules caducous. *Flowers* 2-sexual, 4-5-



25. CELASTRINEÆ.

[*Euonymus*.]

A small deciduous tree with smooth grey bark; branchlets reddish-brown, compressed. *Leaves* 1·5-3 by ·8-1·3 in., ovate, acuminate, finely doubly-serrate, membranous, glabrous; lateral nerves 4-6, very slender; margins reddish-brown when young; petiole ·2·3 in. long; stipules linear, deciduous. *Cymes* umbelliform, mostly from the base of current year's shoots; peduncles 1-3 in. long, with 3-7 very slender branches; pedicels capillary. *Flowers* ·15 in. diam., tetramerous. *Petals* cream-colour, ovate, entire. *Anthers* on short filaments. *Capsule* ·3·5 in. diam., globose; wings usually 4, ·3 in. long, tapering. *Seeds* ovoid, enclosed in a red arillode.

Fairly common in JAUNSAK and TEHRI-GARHWAL, 6, 10,000 ft., generally affecting shady aspects.—Deoban, Konáin, Mundáli, etc.

Wood white, compact, tough, close- and even-grained; weight about 48 lbs. per c. ft. It is carved into spoons. The leaves and branches are lopped for fodder. The seeds are often strung up as beads.

Fl. Apr., May. Fr. Aug.-Oct.

According to Pandit Keshavánand, *E. frigidus*, Wall.; Fl. Br. Ind. i. 611. Vern. *Angáin*, Jaunsar;—occurs in moist places in the Deoban Range, JAUNSAK. It very closely resembles *E. fimbriatus*, differing only in having succulent young shoots, longer and narrower leaves with simple serratures, and much smaller flowers on weak succulent peduncles and pedicels.

3. *E. echinatus*, Wall.; Fl. Br. Ind. i. 611; Brandis For. Flora 80; Gamble Man. Ind. Timb. 84. Vern. *Láduli*, Garhwal.

A climbing shrub adhering to rocks and trees by dense tufts of adventitious roots; shoots quadrangular. *Leaves* variable, ·5-3 by ·2-1 in., ovate or oblong-lanceolate, acute, crenate or obtusely serrate, subcoriaceous, glabrous; main lateral nerves 8-10 pairs, prominent beneath, joining into an intramarginal vein; petiole margined, of the largest leaf ·3 in. long. *Flowers* about 2 in. diam., greenish, in short axillary cymes. *Capsules* ·3 in. diam., globose, covered with dark-coloured spines.

Fairly common in JAUNSAK and TEHRI-GARHWAL, 7, 10,000 ft.—Deoban, Bhújkōti, Mundáli, Deotá, etc.

Fl. Mar., Apr. Fr. Aug., Sept.

4. *E. pendulus*, Wall.; Fl. Br. Ind. i. 612; Brandis For. Flora 79; Gamble Man. Ind. Timb. 84. Vern. *Bhambéld*, Jaunsar.

A small evergreen tree or large shrub with a short trunk, numerous spreading branches, and pendulous branchlets; bark grey, corky. *Leaves* 3-5 by 1-1·5 in., oblong-lanceolate, equally acute at both ends, sharply serrate, coriaceous, glabrous, shining above; lateral nerves indistinct; midrib pale, prominent; petiole ·3·4 in.

long, channelled; stipules minute. *Cymes* axillary or supra-axillary; peduncles 1-2 in. long, much compressed. *Flowers* .3-.5 in. diam., 4-merous. *Calyx lobes* obtuse, fimbriate. *Petals* about .2 in. long, oblong, whitish, fimbriate. *Stamens* short; anthers ovate. *Style* short, filiform. *Capsule* .5 in. diam., 3-4-lobed and sharply angled, more or less winged; arillode reddish-orange.

Open shady aspects and ravines in JAUNSAK and TEHRI-GARHWAL, ascending to 8,500 ft.—Korwá forest, Tutuá and Pámnái Gádhs, Konáin, Lambátách, etc. Very common about Mussoorie.

Wood close- and even-grained; weight 35-40 lbs. per c. ft. It is, however, rarely used except for fuel.

Fl. Apr., May. Fr. June, July.

5. **E. Hamiltonianus**, Wall.; Fl. Br. Ind. i. 612; Brandis For. Flora 78; Gamble Man. Ind. Timb. 84. Vern. *Dádúl*, *Dháruá*, Jaunsar.

A large deciduous shrub with a thick corky ashy-grey bark. *Leaves* variable, 2-6 by .7-1.7 in., oblong or ovate-lanceolate, acuminate, finely serrate, membranous, glabrous, dull-green, not shining; petiole .3-.5 in. long. *Cymes* dichotomous, axillary or intra-axillary; peduncles about 7-flowered. *Flowers* about .3 in. diam., greenish-white. *Petals* .2-.3 in. long, lanceolate or strap-shaped, margins revolute. *Stamens* and *style* .1 in. long. *Capsule* .2-.4 in. diam., turbinate, deeply 3-4-lobed, yellow when ripe. *Seeds* enclosed in a scarlet arillode.

TEHRI-GARHWAL, 8,900 ft., generally in shady localities; Kotigádh, Báichá, etc. Rather scarce in JAUNSAK; Agragádh near Deodan.

Wood white, soft and close-grained, used for carving into ladles. Weight about 40 lbs. per c. ft. The branches are lopped for fodder.

Fl. Mar.-May. Fr. Aug.-Nov.

2. *Celastrus*, Linn.; G. P. n. 16.

Erect or climbing shrubs. *Leaves* alternate; stipules minute, deciduous, sometimes 0. *Flowers* small, 4-5-merous, 1-sexual or polygamous. *Disk* broad. *Petals* usually spreading. *Stamens* inserted on the margins of the disk. *Ovary* 2-4-celled, free or immersed in the disk, with 2 ovules in each cell; style short; stigma simple or 3-lobed. *Fruit* a globose or obovoid loculicidal capsule, 1-3-celled. *Seeds* 1-2 in each cell, more or less enveloped in an aril.

*Analysis of the Species.*

- An unarmed climbing shrub; flowers in large terminal panicles 1. *C. paniculata*.
Armed erect shrubs or trees; flowers in small axillary cymes.
A shrub; leaves ovate or obovate 2. *C. Royleana*.
A tree; leaves lanceolate 3. *C. rufo*.

1. ***C. paniculata***, Willd.; Fl. Br. Ind. i. 617; Brandis For. Flora 82; Gamble Man. Ind. Timb. 86. Vern. *Málkángni* *Málkákni*, Hind.

A large woody climber with corky bark; young shoots marked with lenticels. *Leaves* very variable in size and shape, generally 2-4 by 1·5-3 in., obovate, orbicular, elliptic or oblong-lanceolate, short-acuminate, crenate, more or less coriaceous, glabrous; base acute; lateral nerves 4-6 pairs, parallel to the margins; petiole 4-6 in. long. *Panicles* terminal, large, drooping, pubescent, branching into compound cymes. *Flowers* 15 in. across, pale-green. *Calyx* lobes rounded, toothed. *Petals* oblong. *Anthers* large, about the size of the petals. *Ovary* free; stigma simple. *Capsule* 4·5 in. diam., globose, usually 3-celled, bright-yellow when ripe. *Seeds* 1-2 in. each cell, black, enclosed in a red arillus.

Common in the DÚN and SAHÁRANPUR FORESTS, also at low elevations in JAUNSAH and the OUTER HIMALAYA. It has a striking appearance when in fruit, which hangs gracefully like bunches of yellow beads.

The leaves and seeds are used in native medicine. An oil is extracted from the seeds which is believed to have great medicinal virtue, and is also used for burning.

Fl. Apr.-June. Fr. Cold season.

2. ***C. Royleana***, Wall.: Syn.—*Gymnosporia Royleana* Wall.; Fl. Br. Ind. i. 620. *Celastrus spinosus*, Royle; Brandis For. Flora 80; Gamble Man. Ind. Timb. 86. Vern. *Gowála Dárim*, Hind.

A thorny shrub 8-10 ft. high; bark thin, grey, corky; spines 5-1 in. long, axillary, straight, slender. *Leaves* 5-2 by 3-1·2 in., obovate or ovate, serrate, crenate or subentire, coriaceous, very slightly pubescent when young, lateral nerves faint; tip acute rounded or emarginate; petiole 1-2 in. long. *Cymes* axillary, shorter than the leaves; pedicels slender. *Calyx* lobes ciliate. *Petals* 1 in. long, whitish, ovate-oblong. *Ovary* sunk in the fleshy disk. *Capsule* 2-3 in diam., turbinate, 3-cornered; seeds partially covered with a white aril.



Banks of the Jumná near Dákhpathár, also Ámbári, in the DÚN, and Bádsháhibágh and Khárá in the SAHÁRANPUR DISTRICT. It is likely to be mistaken for *Flacourtia Ramontchi*, which it closely resembles in foliage and general appearance.

Fl. and Fr. almost throughout the year, but more generally in the cold season.

3. **C. rufa**, Wall.; Brandis For. Flora 80. Syn.—*Gymnosporia rufa*, Wall.; Fl. Br. Ind. i. 620.

A tree armed with short axillary spines; very young leaves and inflorescence slightly rusty-pubescent (whence the specific name), otherwise glabrous. *Leaves* 2-4 by 7-13 in., oblong-lanceolate, acuminate, spinous-serrate, subcoriaceous, pale beneath; midrib stout, prominent beneath; lateral nerves much branched, faint; petiole 2-3 in. long. *Cymes* axillary, fascicled, 2-5 in. long; branches and pedicels reddish, capillary. *Flowers* whitish, very small. *Petals* 1 in. long. *Stigma* lobed, spreading. *Capsule* 2-3 in. diam., turbinate, 3-lobed, 3-celled, 3-seeded; seeds black, enclosed in a yellow arillas.

Very scarce. Has been only once found by Mr. J. F. Duthie in the khud below Zabarkhet at MUSSOORIE.

Fl. Mar., Apr. Fr. May, June.

The following species are also likely to occur in the SCHOOL CIRCLE:—

C. acuminata, Hook. f. Syn.—*Gymnosporia acuminata* Hook. f.; Fl. Br. Ind. i. 619. *Leaves* 2-3 in. long, narrowly ovate-oblong serrate, acute at both ends, membranous. *Capsule* about 5 in diam., 2-celled, 2-seeded.

C. montana, Roxb. Syn.—*Gymnosporia montana*, Roxb., Fl. Br. Ind. i. 621. *Celastrus senegalensis*, Lam.; Brandis For. Flora 81. *Leaves* subsessile, 1-2 by 3-8 in., oblanceolate or obovate, crenulate, coriaceous. *Capsule* 15 in. diam., 1-3-celled, black.

3. **Elæodendron**, Jacq. fil.; G. P. n. 28.

1. **E. glaucum**, Pers.; Fl. Br. Ind. i. 623. Syn.—*E. Roxburghii*, W. & A.; Brandis For. Flora 82; Gamble Man. Ind. Timb. 87. Vern. *Dhebrí*, Hind.; *Jangéla*, *Jangél*, E. Dún; *Fániála*, W. Dún.

A moderate-sized or large tree, often with reddish branchlets; bark dark-grey, smooth, blood-red inside, exuding when cut a profuse watery sap from the cambium-layer. *Leaves* opposite or sub-opposite, less frequently alternate, 2-6 by 1-3 in., elliptic, ovate, oblong or



obovate, acuminate, crenate, sub-coriaceous, glabrous, dark-green and shining above, glaucous beneath (whence the specific name); main lateral nerves about 10 pairs, slender; petiole 4-1 in. long, channelled. *Cymes* axillary, dichotomous, 3-5 in. long; peduncle 1-2.5 in. long, often red. *Flowers* 2 in. diam., whitish. *Calyx* 4-5-cleft; segments obtuse. *Disk* fleshy. *Petals* 4-5, about 1 in. long, oblong. *Stamens* 4-5, short, inserted under the edge of the disk; filaments recurved. *Ovary* adnate to the disk; style very short. *Fruit* a dry obovoid drupe, 4-6 in. long, 1-celled, 1-seeded, tipped with the persistent style, mostly sterile (reproduction chiefly by root-suckers).

DÚN and SAHÁRANPUR FORESTS, also in valleys in the HILLS, generally affecting a clayey binding soil, and consequently with Sáin in Sál forests.—Tháno, Lachiwála, Karwápáni, Timli-pass, Dholkhand, Ránipur, Kálsi, etc.

Wood moderately hard, even- and close-grained, deep-red when fresh-cut, turning light-brown in seasoning; weight 40-50 lbs. per c. ft. It takes a fine polish, and is used for cabinet-work and picture-frames. Forest contractors in the Dún generally convert it into karries, which are exported into the plains districts and sold there as Sál. "The root is believed to be a specific for snake-bites, and the bark is used in native medicine."—*Sir D. Brandis*.

Leafless in Apr. Fl. Feb.-June. Fr. Jan.-June of the next year.

ORDER 26. RHAMNEÆ; G. P. N. 49.

Trees or shrubs, often armed. *Leaves* simple, generally alternate; stipules small, sometimes changed into prickles. *Flowers* 1-sexual or polygamous, green or yellow, small, usually in axillary cymes. *Calyx* 4-5-cleft; lobes triangular, valvate in bud. *Petals* 4-5 or 0, involute, inserted on the throat of the calyx-tube, alternating with and generally shorter than the calyx-segments. *Disk* various. *Stamens* 4-5, opposite to the petals and often enclosed within their folds; anthers versatile. *Ovary* free or more or less immersed in the disk, usually 3-celled, with one ovule in each cell. *Fruit* various, generally indehiscent; seeds 1-4.

Analysis of the Genera.

- Ovary superior or half-superior.
 Scandent shrubs. Fruit terminating in a long wing. 1. VENTILAGO.
 Generally erect shrubs. Fruit not winged.
 Disk thick, filling the calyx-tube.
 Leaves more or less oblique, 3-5-nerved at the base.
 Armed. Fruit with a 1-4-celled stone; peduncle not thickened. 2. ZIZYPHUS.
 Unarmed. Fruit 3-seeded; peduncle thickened in fruit. 5. HOVENIA.
 Leaves symmetrical, penninerved.
 Leaves alternate; drupe 2-celled, 2-seeded. 3. BERCHEMIA.
 Leaves opposite or sub-opposite; fruit 3-celled, 3-seeded. 6. SAGERETIA.
 Disk thin, lining the calyx-tube.
 (Leaves symmetrical, alternate; fruit 2-4-seeded). 4. RHAMNUS.
 Ovary inferior. Cirrrose climbing shrubs.
 Flowers racemed; fruit winged. 7. GOUANIA.
 Flowers umbelled; fruit not winged. 8. HELINUS.

1. *Ventilago*, Gærtn. ; G. P. n. 1.

1. *V. calyculata*, Tulasne; Fl. Br. Ind. i. 631; Brandis For. Flora 96. Vern. *Kāli-bel*, Dún.

A large woody climber generally with strong tendrils; branchlets pubescent; bark dark-grey. *Leaves* 2-4 by 1-2.5 in., ovate or oblong-elliptic, more or less acute, crenate or entire, subcoriaceous pubescent when young; lateral nerves 6-8 pairs, arcuate; base unequal; petiole .2-.4 in., pubescent. *Flowers* numerous, small, greenish, in large terminal panicles. *Calyx* pubescent; lobes 5-keeled inside. *Petals* 5, deflexed. *Disk* 5-lobed, filling the calyx-tube. *Ovary* 2-celled, sunk in the disk; style short. *Fruit* a subglobose nut, about .2 in. diam., girt about the middle by the rim of the adherent calyx-tube, prolonged into a wing which is 1-1.5 by .3-.4 in., linear, strongly reticulate, with a prominent straight midrib.

Shady mixed forests and ravines in SAHARANPUR and the DÚN ; — Kasúmrí, Chilláwála; Tháno, Káluwála, Nakraunda, Lachiwála Dúdhli, Báiwála, Khairi, etc.

Wood pale-yellow, tough, capable of being used for fuel,

Fl. Feb., Mar. Fr. May, June.



2. Zizyphus, Juss. ; G. P. n. 4.

Trees or shrubs, sometimes sarmentose, usually armed with stipulatory prickles. *Leaves* alternate, more or less distichous, subcoriaceous, 3-5-nerved at the base. *Flowers* small, in axillary fascicles or cymes. *Calyx* 5-fid; lobes keeled within. *Petals* 5 or 0, deflexed. *Disk* 5-10-lobed, coating the calyx-tube; edges free. *Stamens* 5. *Ovary* immersed in the disk and adnate to it at the base, 2-4-celled; styles 2-4, free or partly connate. *Fruit* a fleshy or dry drupe with a hard 1-4-celled, 1-4-seeded stone.

Analysis of the Species.

Flowers fascicled or in sessile cymes.

Leaves broad-ovate or suborbicular, glabrous above, felted beneath; drupe over .5 in. long.

1. *Z. Jujuba*.

Leaves ovate-lanceolate, acuminate; drupe about .3 in. diam.

An erect shrub; leaves wholly glabrous; prickles usually in pairs.

2. *Z. oxyphylla*.

A straggling shrub; leaves hairy on both surfaces; prickles solitary.

3. *Z. Ænopia*.

Flowers in peduncled cymes; leaves generally obtuse, glabrous above.

Cymes short, simple; drupe 1 in. diam., dry, tomentose, 3-celled.

4. *Z. xylopyra*.

Cymes long, panicle; drupe .3 in. diam., fleshy, glabrous, 1-celled.

5. *Z. rugosa*.

1. *Z. Jujuba*, Lam.; Fl. Br. Ind. i. 632; Brandis For. Flora 86; Gamble Man. Ind. Timb. 88. Vern. *Ber*, *Beri*, Hind. The cultivated variety is called *Pewandi* or *Pemdi Ber*, and the degraded form *Jhâr Beri*, Hind.

A moderate-sized tree, almost evergreen; bark dark-grey or nearly black, with long deep vertical cracks, reddish and fibrous inside; young parts rusty-tomentose. *Leaves* very variable, 1-4 by .6-3 in., suborbicular, elliptic or ovate, closely serrulate or entire, rounded at both ends, dark-green glabrous and often shining above, densely woolly-tomentose beneath; base more or less oblique, strongly 3-nerved, nerves closely penniveined; petiole 1-6 in. long; prickles solitary or in twos. *Flowers* greenish-yellow, in short axillary cymes or fascicles, scarcely exceeding the petioles. *Calyx*

glabrous within. *Petals* concave, reflexed. *Disk* 10-lobed. *Ovary* 2-celled; styles 2. *Drupe* 2-celled, very variable in size and shape, .5-1.5 in. long, globose to elliptic or obovoid-acuminate, red or orange when ripe.

Extremely common and gregarious along the foot of the SAHÁRANPUR SIWALIKS, especially at Beribára. Represented in the DÚN by what appears to be a degraded form, which is common as a bush in grass-lands. The *Pewandi Ber* is cultivated in gardens, especially in SAHÁRANPUR.

Wood hard, compact, tough, reddish; annual rings not distinct; weight 43-52 lbs. per c. ft. It is used for agricultural implements, and is very good for fuel and charcoal. The fruit is eaten. Lac is produced on its branches. The branches and leaves are lopped for fodder.

Fl. Sept.-Nov. Fr. Dec.-Feb.

2. **Z. oxyphylla**, Edgew.; Fl. Br. Ind. i. 634; Brandis For. Flora 85; Gamble Man. Ind. Timb. 89. Vern. *Beri*, Jaunsar.

A thorny shrub, usually with a few scattered hairs on young parts, otherwise quite glabrous; bark thin, brown. *Leaves* 1-2 by .7-1.3 in., ovate-lanceolate, gradually acuminate, mucronate, finely serrate, rather membranous, glabrous; base subcordate, oblique, 3-nerved; petiole 2-4 in. long, slender; prickles weak, usually in twos, one of which points upwards. *Flowers* pale, in axillary fascicles, about .15 in. diam.; pedicels slender, .2-.3 in. long. *Calyx-lobes* triangular, acute. *Petals* clawed. *Disk* thin, 5-lobed. *Ovary* 2-celled; styles 2, united to beyond the middle. *Drupe* about .3 in. long, ovoid, fleshy, 2-celled and 2-seeded, less frequently 1-celled and 1-seeded, orange-red when ripe but drying black; seeds brown, plano-convex.

Up to 6,000 ft. in JAUNSAAR and TEHRI-GARHWAL, generally round villages and in open valleys: Binálgádh, Dhármigádh, Siligádh, etc.

Wood white, moderately hard. It is often planted in hedges and also for its acid fruit which tastes like tamarind.

Fl. May, June. Fr. Oct., Nov.

3. **Z. Cœnoplia**, Mill.; Fl. Br. Ind. i. 634; Brandis For. Flora 86; Gamble Man. Ind. Timb. 89. Vern. *Makōh*, Saháranpur.

A thorny shrub with long sarmentose branches; bark rough dark-grey. *Leaves* 1-2 by .7-1 in., very obliquely ovate-lanceolate, mucronate, obscurely crenate-serrate or subentire, more or less



pubescent above, softly rusty-tomentose beneath; base 3-4-nerved; petiole 1-3 in. long, pubescent, rather stout; prickles small, recurved, generally solitary. *Cymes* dichotomous, compressed. *Calyx* tomentose outside. *Petals* obtriangular. *Ovary* 2-celled: styles 2, united to above the middle. *Drupe* about .25 in. diam., sub-globose or ovoid, black when fully ripe, with a scanty mealy acid pulp, 2-celled, 2-seeded, but generally 1-celled and 1-seeded by abortion.

Common along the foot of the SAHÁRANPUR SIWALIKS. Somewhat rare in the DŪN.

The long branches are much in demand for fencing round fields, and the plant is often grown in hedges. The fruit is eaten.

Fl. Apr., May. Fr. Cold season.

4. **Z. xylopyra**, Willd.; Fl. Br. Ind. i. 634; Brandis For. Flora 90; Gamble Man. Ind. Timb. 89. Vern. *Bhandar*, *Kath Ber*, Dún and Saháranpur.

A large erect shrub; branches more or less straggling; young shoots rusty-tomentose; bark thin, brownish-grey, smooth or rough with small exfoliating scales. *Leaves* 1-3.5 by .7-2.5 in., orbicular, broadly elliptic or obovate, serrulate, obliquely sub-cordate or rounded at the base, tip rounded or acute, slightly pubescent along the nerves otherwise glabrous above, brown-pubescent beneath; petiole 1-3 in., tomentose; prickles usually in twos, one straight, the other recurved, often wanting. *Cymes* axillary, peduncled. *Flowers* scarcely .1 in. diam. *Calyx* lobes keeled only at the apex. *Petals* reflexed. *Disk* thin, 5-angled. *Ovary* usually 3-celled: styles 3, almost free. *Drupe* about 1 in. diam., globose, often depressed at the ends, more or less white-tomentose, dry, not edible; cells 3.

Common in the DŪN and SAHÁRANPUR DISTRICTS, generally in scrub forests, but is sometimes also found with Sál.

Wood yellowish-brown, hard and durable, also easy to work, but is seldom used except for fuel; weight about 50 lbs. per c. ft. The bark is used for tanning, and the leaves for fodder. The fruit is used to give a black dye to leather.

Leafless Mar., Apr. Fl. Apr., May. Fr. Cold season.

5. **Z. rugosa**, Lam.; Fl. Br. Ind. i. 636; Brandis For. Flora 89; Gamble Man. Ind. Timb. 90. Vern. *Bhand Ber*, Dún.

A small evergreen tree; branches few, somewhat straggling; young parts generally rusty-tomentose; bark dark-grey or nearly

black, deeply cracked into thick rectangular scales. *Leaves* 2-4 by 1-7-3-5 in., sub-orbicular ovate or elliptic, closely serrulate, subacute, obliquely rounded or sub-cordate at the base, dark-green and glabrous above, thickly grey- or rusty-felted beneath; basal nerves 3, each closely penniveined; petiole 2-3 in. long, stout; prickles few, usually solitary, recurved. *Cymes* arranged in long axillary or terminal panicles which are often 1 ft. long, rusty-tomentose throughout. *Calyx-lobes* not keeled. *Petals* 0. *Disk* 5-angled, hairy. *Ovary* 2-celled; styles 2, united below the middle. *Drupe* about 3 in. long, globose or pyriform, 1-celled, 1-seeded.

Along the foot of the Nāgsidh Hill and at Rāngarh in the DŪN, also in valleys in the HILLS up to 3,000 ft.; not very common.

Wood reddish, moderately hard, but warps and is liable to be attacked by insects. It is used chiefly for fuel. The fruit is eaten and the leaves are lopped for fodder.

Fl. Mar., Apr. Fr. Rainy season.

3. Berchemia, Neck.; G. P. n. 8.

Unarmed erect or climbing shrubs. *Leaves* alternate, closely penninerved. *Flowers* usually 5-merous and 2-sexual. *Calyx* persistent. *Petals* usually obovate or oblanceolate. *Disk* lining the calyx-tube. *Ovary* 2-celled, sunk in the calyx-tube, but not adnate to it. *Fruit* a drupe or berry, usually tipped with the remains of the style; kernel 2-celled, 2-seeded.

Analysis of the Species.

- | | |
|--|---------------------------|
| A climbing shrub; leaves 2-4 in. long | 1. <i>B. floribunda</i> . |
| An erect shrub; leaves about 5 in long | 2. <i>B. lineata</i> . |

1. ***B. floribunda***, Brongn.; Fl. Br. Ind. i. 637; Brandis For. Flora 91; Gamble Man. Ind. Timb. 90. Vern. *Kauloi* or *Kāuloi*, Jaunsar; *Amili*, Garhwal.

A large climbing shrub; bark thin, whitish outside, inner layer purple. *Leaves* 2-4 by 1-2 in., ovate or oblong, acuminate, thinly sub-coriaceous, glabrous, rounded or sub-cordate at the base; lateral nerves 10-12 pairs, straight, parallel, slender but distinct; petiole 5-7 in. long, terete; stipules 2-fid. *Flowers* minute, "3-10 in cymose



clusters, arranged in racemes 2-3 in. long, which again form large terminal panicles."—*Sir D. Brandis*. *Fruit* 3·5 in. long, ovate-oblong or cylindrical, fleshy.

Swampy localities in the DŪN, *e.g.*, Káluwála, Nakraunda Jogiwála, etc., and in shady ravines up to 4,500 ft. in the HILLS, *e.g.*, Binálgádh, Chátrágádh, etc.

Fl. May-July. Fr. Feb.-Apr.

2. **B. lineata**, DC.; Fl. Br. Ind. i. 638; Brandis For. Flora 91. Vern. *Angári*, Jaunsar.

A small shrub 3-5 ft. high, with smooth shining bark; young shoots puberulous. *Leaves* variable, generally about 5 in. long, oblong or ovate, elegantly marked underneath with 6-8 pairs of fine straight nerves; petiole 1·2 in. long, slender; stipules bristle-like. *Flowers* minute, in axillary or terminal clusters. *Calyx-lobes* linear. *Petals* linear-lanceolate. *Berry* 25·4 in. long, cylindrical, blue when ripe.

JAUNSAAR and TEHRI-GARHWAL, 8-9,000 ft.; not very common. Bájámára; below "Snow View" and at Kanjátra, Deoban, etc.

Fl. May-July. Fr. Sept.

B. Edgeworthii, Lawson; Fl. Br. Ind. i. 638; a shrub closely resembling the above, but with glabrous branches, 6-merous flowers, and somewhat larger leaves and fruit, has also been found in JAUNSAAR and TEHRI-GARHWAL, *e.g.*, Durani Dhár, Oshlá, Kanjátra, etc.—*Mr. J. S. Gamble*.

4. *Rhamnus*, Linn.; G. P. n. 10.

Shrubs or trees, sometimes with spinescent branchlets. *Leaves* alternate, or fasciated (by the arrest of the growth of the branchlets), penninerved. *Flowers* unisexual or polygamous, in axillary fascicles or cymes. *Calyx* 4-5-fid; lobes keeled within. *Disk* thin, lining the calyx-tube. *Petals* 4-5 or 0. *Stamens* 4-5, inserted with the petals on the edge of the disk; filaments short. *Ovary* free, 2-4-celled, narrowed into a 3-4-celled style; stigma papillose. *Fruit* a berry-like drupe, 2-4-celled, 2-4-seeded, seated on the persistent calyx-tube.

Analysis of the Species.

Erect shrubs or trees.

Spinescent shrubs; leaves mostly fascicled;
 flowers 4-merous.

Leaves sub-coriaceous, on growing shoots
 alternate; stem ash-coloured.

1. *R. persicus*.

Leaves membranous, on growing shoots sub-
 opposite; stem shining dark-grey.

2. *R. dahuricus*.

Unarmed shrubs; leaves not fascicled; flowers
 5-merous.

Leaves membranous; branchlets purple;
 cymes sessile.

3. *R. purpureus*.

Leaves sub-coriaceous; branchlets green;
 cymes racemed.

4. *R. triqueter*.

A prostrate shrub, not armed.

(Leaves coriaceous; flowers 5-merous) . . . 5. *R. procumbens*.

1. ***R. persicus***, Boiss.; Fl. Br. Ind. i. 638; Brandis For.
 Flora 93. Vern. *Chirla*, Dún.

A deciduous shrub with a short erect trunk and stiff branches,
 often armed; bark smooth, ash-coloured; epidermis peeling off
 generally in vertical strips. *Leaves* alternate on growing shoots, fas-
 cicled on arrested branchlets, .5-2 in. long, ovate, elliptic, lance-
 olate or obovate, acute, acuminate or rounded at the tip, minutely
 serrulate or entire, sub-coriaceous, slightly tomentose beneath; petiole
 minute to .3 in. long. *Flowers* 4-merous, short-pedicelled, diæcious,
 in axillary fascicles. *Petals* small, linear. *Fruit* about .2 in. diam.,
 obovoid or turbinate.

In the DÚN at Mothronwála, and near the Harbanswála Chauki;
 also in JAUNSAIR up to 6,000 ft., *e. g.*, Saiá, the slopes below Konáin
 village, etc.

The fruit is eaten, and the leaves are browsed by goats.

Fl. Mar.-May, before the new leaves, but generally throughout
 the year. Fr. Chiefly Nov., Dec.

2. ***R. dahuricus***, Pall.; Fl. Br. Ind. i. 639. Syn.—
R. virgatus, Roxb.; Brandis For. Flora 92; Gamble Man. Ind.
 Timb. 91. Vern. *Thanthár*, Jaunsar; *Chaurdhá*, Garhwal.

A deciduous shrub or small tree, generally with a stout spine at
 the forks of the branches; bark dark-grey, thin, smooth, shining,
 peeling off in horizontal rolls. *Leaves* generally sub-opposite on growing
 shoots, fascicled on arrested branchlets, .5-2 by .2-1 in., rhomboidal ovate
 or ovate-lanceolate, acuminate, minutely serrulate or entire, mem-
 branous, slightly pubescent beneath when young; lateral nerves 3-5
 pairs, slender; base acute; petiole .1-4 in. long. *Flowers* 4-merous,



in dense axillary fascicles; buds pointed; pedicels long or short, filiform. *Calyx* tube campanulate. *Petals* minute. *Fruit* about .15-.25 in. diam., globose.

Common in JAUNSAK and TEHRI-GARHWAL between 3,000 and 9,000 ft., also along the Bindál Nálá, DEHRA DÚN.

The wood is hard and close-grained; weight 56 lbs. per c. ft. Capable of being used for agricultural implements. "The fruit is bitter, emetic and purgative, and is given in affections of the spleen."—*Mr. J. S. Gamble*.

Fl. Apr.-June. Fr. Cold season. Often fl. and fr. throughout the year.

3. **R. purpureus**, Edgew.; Fl. Br. Ind. i. 639; Brandis For. Flora 91; Gamble Man. Ind. Timb. 92. Vern. *Luhish*, *Lhish*, Jaunsar.

An unarmed deciduous shrub; bark thin, smooth. *Leaves* alternate, 2-4 by 1-2 in., elliptic or ovate-lanceolate, acuminate, serrate or crenate, membranous, pubescent beneath when young; lateral nerves 6-10 pairs, somewhat arcuate, prominent. *Flowers* 2-sexual, 5-merous, in short axillary cymes; buds ovoid. *Calyx* cup-shaped; segments acute. *Petals* 0. *Style* short, 3-cleft. *Drupe* about .2-.3 in. diam., sub-globose or pyriform.

JAUNSAK and TEHRI-GARHWAL between 4,500 and 9,500 ft. Common at Deoban, Mundáli, Deotá, etc., generally on open shady aspects.

Wood brownish-grey, close-grained; weight 41 lbs. per c. ft. The fruit is used as a purgative.

Fl. May, June. Fr. July-Oct.

4. **R. triqueter**, Wall.; Fl. Br. Ind. i. 639; Brandis For. Flora 92; Gamble Man. Ind. Timb. 92. Vern. *Katherú*, Jaunsar; *Gaupt*, Dún and Garhwal.

An unarmed deciduous shrub; bark dark-grey, thin. *Leaves* 2-6 by 1-2 in., ovate-oblong, acuminate, closely serrate, glabrescent above, finely pubescent beneath, somewhat brittle, drying yellowish-green, often mixed with smaller leaves which are .5-1 in. long; lateral nerves 8-10 pairs, arcuate; base rounded or acute; petiole .3-1 in. long. *Racemes* of cymes 2-4 in. long, axillary, sometimes with a few leaf-like small bracts. *Flowers* puberulous. *Calyx* lobes acute. *Petals* clawed, emarginate, sheathing the stamens. *Drupe* 3-lobed.

OUTER HIMALAYA and JAUNSAK 3,600 ft. Common below Mussoorie and also about Tiuni in the Tons valley. MÁLKÓT HILLS down to Tháno in the DÚN. Also in the SIWALIKS, e.g., in the Timli Pass.

Wood yellowish-brown, hard and close-grained, capable of being used for agricultural implements.

Fl. July, Aug. Fr. Oct.-Dec.

5. **R. procumbens**, Edgew.; Fl. Br. Ind. i. 640; Brandis For. Flora 93; Gamble Man. Ind. Timb. 92.

A small procumbent shrub, usually trailing on rocks; young branches pubescent. *Leaves* 3-1 in., elliptic or lanceolate, acute or acuminate, serrulate, coriaceous, dark-green; midrib prominent beneath, depressed above; lateral nerves faint; petiole of the largest leaf about 1 in. long; stipules setaceous, persistent. *Flowers* axillary, often solitary, on slender pedicels which are 2-5 in. long. *Fruit* about 15 in. diam., globose, fleshy.

JAUNSAH, 7,000 to 8,500 ft. Common on rocks at Matkangrá and in the Mohná Block, Deoban; Tutuá Block, Mundáli, etc.

Wood yellowish, hard, close-grained and tough.

Fl. July, Aug. Fr. May, June (next year?)

5. *Hovenia*, Thunb.; G. P. n. 12.

1. **H. dulcis**, Thunb.; Fl. Br. Ind. i. 640; Brandis For. Flora 94; Gamble Man. Ind. Timb. 88.

A small deciduous tree with a straight trunk. *Leaves* alternate, 4-6 by 2-3.5 in., ovate, long-acuminate, often inequilateral, serrate, membranous, glabrescent above, more or less tomentose beneath, 3-nerved at the base; lateral nerves 3-5 pairs above the basal; petiole 5-7 in. long. *Flowers* 2-sexual, white, in axillary and terminal dichotomous cymes; peduncle 1-2 in. long. *Calyx* 5-fid; tube conical, deciduous. *Petals* 5, clawed. *Disk* fleshy, woolly. *Stamens* 5, longer than the petals, inserted on the edge of the disk. *Ovary* 3-celled, sunk in the disk; styles 3. *Fruit* a 3-celled 3-seeded indehiscent drupe, about 3 in. diam.; the peduncle and part of the inflorescence thicken into a fleshy mass when the fruit ripens.

JAUNSAH and TEHRI-GARHWAL, 3,000 to 6,500 ft.: Thadiár, Bámsu, Dárnagádh, etc.

The fleshy peduncle is sweet and aromatic, and is eaten. The leaves are eaten by cattle.

Fl. Apr.-June. Fr. July-Sept.

6. *Sageretia*, Brongn.; G. P. n. 15.

1. **S. oppositifolia**, Brongn.; Fl. Br. Ind. i. 641; Brandis For. Flora 95; Gamble Man. Ind. Timb. 92. Vern. *Gonta*, E. Dún.



A shrub or small tree with long subscandent spinous branches ; branchlets tomentose when young. *Leaves* opposite, 2-4 by 1-1.5 in., those towards the end of the branches usually much smaller, ovate-lanceolate, acute or acuminate, serrate or sub-entire, sub-coriaceous, glabrescent above, pubescent (at least along the nerves) beneath ; lateral nerves 5-8 pairs, impressed above, prominent beneath ; base rounded, rarely subcordate ; petiole .5 in. *Flowers* very small, in large terminal panicles with opposite racemose ramifications, often mixed with small membranous leaves. *Calyx* flat, 5-toothed. *Petals* 5, clawed, hooded. *Disk* cup-shaped, lining the calyx-tube. *Stamens* 5, as long as the petals. *Ovary* 3-celled, narrowed into three coherent styles. *Fruit* berry-like, turbinate, .2-.3 in. diam., black when ripe.

Throughout the OUTER HIMALAYA, 3-6,000 ft. : Málkōt, Jákhān Canal, below Mussoorie, Sahansra-dhárá, Saia, Korwá, etc.

The wood is tough and is sometimes used for axe-handles. The fruit is edible.

Fl. July, Sept. Fr. Apr.-June.

7. *Gouania* Linn. ; G. P. n. 35.

1. *G. leptostachya*, DC. ; Fl. Br. Ind. i. 643 ; Brandis For. Flora 574 ; Gamble Man. Ind. Timb. 88.

An unarmed climbing shrub bearing tendrils at the ends of the branchlets. *Leaves* alternate, 2-4 by 1.5-2.5 in., ovate, acuminate, crenate, sub-coriaceous, more or less rusty-pubescent beneath when young ; lateral nerves 5-6 pairs, often opposite, arcuate, the lowest pair from near the base ; base rounded or sub-cordate ; petiole .3-.6 in. long. *Flowers* white, about .15 in. diam., in axillary or terminal often leaf-bearing racemes which are 6-10 in. long and generally simple. *Calyx* superior, 5-fid. *Disk* filling the calyx-tube, 5-lobed. *Petals* 5, inserted below the margin of the disk. *Stamens* 5, enfolded by the petals. *Ovary* 3-celled, sunk in the disk. *Fruit* .5 in. long, 3-winged, 3-celled, 3-seeded, crowned by the remains of the calyx.

Common almost throughout the DŪN. : Barotiwála, Ámbári, Robbers' Cave, Bindál nálá, Lachiwála, Káluwála, Tháno, Khairi, etc., spreading on trees, with a graceful appearance when in flower.

Fl. Aug., Sept. Fr. Nov., Dec.

8. *Helinus*, E. Meyer ; G. P. n. 36.

1. *H. lanceolatus*, Brandis For. Flora 574 ; Fl. Br. Ind. i. 644.

An unarmed twining shrub ; branches slender, branchlets angular, usually with a tendril near the end. *Leaves* 1-3 by .5-1 in., lanceolate, very gradually acute, rather membranous, wholly glabrous



27. AMPELIDEÆ.

CSL

slightly canescent beneath; lateral nerves 3-4 pairs, slender; base rounded or sub-cordate, 3-nerved. *Flowers* about 2 in. diam., pale-yellow, umbelled on short lateral branchlets, each umbel subtended by a bract or rudimentary leaf 3-7 in. long; peduncles 5-1 in. long, slender. *Calyx* superior, cup-shaped. *Disk* filling the calyx-tube. *Petals* 5, hooded, inserted on the margin of the disk. *Stamens* 5, equalling the petals. *Ovary* 3-celled; stigmas recurvel. *Fruit* 2-3 in. diam., broadly turbinate or globose, 3-celled, 3-seeded, tardily dehiscent.

Ravines, banks of streams and shady places in the DŪN, and in the SAHĀRANPUR SIWALIKS, also occasionally in valleys in JAUNSAIR: Tapkeshwar, Lachiwāla; Shāhjahānpur, Rānipur, etc.

Fl. and fr. almost throughout the year.

ORDER 27. AMPELIDEÆ; G. P. N. 50.

Erect or climbing shrubs usually with copious watery juice. *Leaves* alternate, stipulate, simple or compound. *Flowers* regular, cymose, usually 2-sexual. *Calyx* entire, or 4-5-toothed or lobed. *Petals* 4-5, free or cohering at the base or apex, valvate, caducous. *Disk* fleshy. *Stamens* as many as the petals and opposite to them; filaments subulate, sometimes monadelphous. *Ovary* 2-6-celled; style short or none. *Fruit* a berry with 1-6 bony seeds.

Analysis of the Genera.

- | | | |
|--------------------------------|----------|-----------|
| Climbing shrubs; stamens free | ovary | |
| 2-celled | | 1. VITIS. |
| Erect shrubs or herbs; stamens | | |
| adelphous; ovary 3-6-celled | is mona- | 2. LEEA. |

1. Vitis, Linn.; G. P. n. 1.

Climbing shrubs, usually with leaf-opposed tendrils. *Leaves* simple or 3-9-foliolate. *Flowers* variously cymose, 2-sexual or polygamous. *Calyx* 4-5-lobed. *Petals* 4-5, free or cohering at the apex. *Stamens* free, inserted below the margins of the disk. *Ovary* usually 2-celled, with 2 ovules in each cell; style short or 0. *Fruit* a 1-4-seeded berry.



Analysis of the Species.

Leaves simple.

Flowers tetramerous 1. *V. repanda*.

Flowers pentamerous.

Branches and under surface of leaves

densely tomentose 2. *V. rugosa*.

Branches and leaves glabrous, or the
latter slightly pubescent.

Stem soft; leaves broader than long 3. *V. latifolia*.

Stem woody; leaves longer than broad 4. *V. parvifolia*.

Leaves 3-foliolate; flowers pentamerous . 5. *V. semicordata*.

Leaves pedately 5-foliolate; flowers tetra-
merous 6. *V. capriolata*.

1. *V. repanda*, W. & A.; Fl. Br. Ind. i. 648.

A large climber; branches ribbed, brittle, woolly when young; old stem with wrinkled bark. *Leaves* simple, 3-5 by 2.5-4 in., ovate, cordate, acuminate, crenate with sharp points, rusty-tomentose beneath when young, glabrescent when old; petiole 1-3 in. long; tendril forked. *Flowers* in slender umbel-bearing cymes; peduncle 1-4 in. long. *Petals* cream-colored, connate at the apex. *Fruit* 3-4 in. long, pyriform, tipped with the persistent style.

The *Dûn*, and at low elevations in JAUNSAR and TEHRI-GARHWAL; not common. Phândowála.

Fl. May, June. Fr. Rainy season.

2. *V. rugosa*, Wall.; Sir G. King in Journ. As. Soc. Beng. lxxv, Part ii, No. 2, p. 111. Syn.—*V. lanata*, Roxb.; Fl. Br. Ind. i. 651; Brandis For. Flo. a 99. Vern. *Bhináná*, Jaunsar.

A large woody climber; branches inflorescence and leaves covered with reddish or brown felted tomentum. *Leaves* simple, 3-4 in. diam., ovate or suborbicular; cordate, acuminate, dentate, more than above, sometimes obscurely 3-lobed, densely tomentose beneath; petiole 1-2.5 in. long; tendrils simple or 3-7-nerved at the base; panicles in large leaf-opposed compound panicles; forked. *Flowers* greenish, usually with a tendril at the apex. *Petals* peduncle 1-3 in. long, generally. *Stamens* long; filaments very slender. pale-green, connate above, imbricate, usually 1-seeded. *Fruit* about 2 in. diam., globose.

Common throughout the HILLS up to 5,000 ft.: Málkôt, Bájpur, Dhárágádh and other valleys, Thadiár, etc.

The stem yields an abundance of watery sap which can be drunk.

Fl. Apr.-June. Fr. July-Sept.



3. **V. latifolia**, Roxb.; Fl. Ind. i. 652; Brandis For. Vern. *Páni-bel*, Hind.

A large climber; stem soft, veinous, furrowed and corky outside when old; branches labrous, simple, 3-7 by 4-8 in., suborbicular, cordate, 5-angled or 3-angled, dentate, membranous, pubescent beneath when young, 5-nerved at the base; lateral nerves 3-7 pairs above the base; nerves and veins always more or less pubescent beneath; petiole 2-4 in. long and terdrial slender, forked, one of the forks developing inflorescence. Flowers reddish-brown, in compound pyramidal racemes. Petals distinct. Stigma sessile. Leaves 3-4 in. long, black, 2-seeded; seeds elliptic, rugose on the ms.

Common in the DÚN and SAHÁRANPUR FORESTS, generally climbing on Sál and other tall trees.

The stem yields when cut a large quantity of good potable water, which is a great relief to coolies working in dry waterless forests.

Leaves Nov.-Mar. Fl. May-July. Fr. Oct.-Dec.

4. **V. parvifolia**, Roxb.; Fl. Br. Ind. i. 652; Brandis For. Flora 99.

A slender woody climber, wholly glabrous. Leaves simple, 1-2.5 by .7-2 in. triangular-ovate, acuminate, dentate or very distantly serrate, sometimes lobed, membranous but tough, quite glabrous; lateral nerves 3-5 pairs above the cordate and 5-nerved base; tendrils 2-fld. Flowers minute, green, on slender umbellately-clustered pedicels; clusters arranged on simple or divided erect leaf-opposed racemes, peduncle .5-7 in. long; pedicels .2 in. long, filiform, much thickened in fruit. Petals cohering at the apex. Style distinct, short. Fruit about .3 in. diam., 1-seeded, globose, black when ripe.

Fairly common in JAUNSAH and TEHRI-GARHWAL and the OUTER HIMALAYA, 3,600 ft.: Málkōt; below Mussoorie; Saia, Korwá, Dhárágádh; Thadiár, Bámsu, etc.

Fl. Apr., May. Fr. June, July.

Closely allied to the last two species is the European Grape Vine, *V. vinifera*, Linn.; Fl. Br. Ind. i. 652. Vern. *Angúr-ki bel*, Hind.—which is cultivated to some extent in the Dún and at Saháranpur, but does not bear good fruit, as the time for it to ripen comes in the rainy season, when there is not sufficient sunshine.

5. **V. semicordata**, Wall., var. *Roylei*, King Journ. As Soc. Beng. lxx. Part ii. p. 113. Syn.—*V. himalayana*, Brandis, For.



Flora 100; Fl. Br. Ind. i.
Jaunsar.

Vern. *Kandár*-(báli),. *Pánlu-ki bál*,

A large climber with smooth bark. *Leaves* 3-foliate *Leaflets* 2-4 by 1.5-2 in., thus al very obliquely ovate, the terminal rhomboidal or elliptic, acuminate serrate or dentate, pilose along the nerves beneath; lateral nerves about 8 pairs; common petiole 1-3 in.; petiolule 1-2 in.; tendril 0. *Flowers* yellowish-green, in compound trichotomous leaf-opposed cymes. *Style* short, stout. *Fruit* 3-4 in. diam., 4-sided, black when ripe.

JAUNSAR and TEHRI-GARHWAL, 3,9,000 ft.; common.

Wood brown, hard, mottled with a pretty silver grain, capable of being used for picture-frames

Fl. Apr., May. Fr. Aug., Sept.

6. *V. capriolata*, Dor; Fl. Br. Ind. i. 659; Randis For. Flora 101.

A slender wiry climber. *Leaves* pedately quinefoliolate. *Leaflets* very variable, .5-4 by .3-1.3 in., obovate to narrow-lanceolate, acute or acuminate, the lateral more or less oblique cuspidately serrate, membranous, glabrous; petiole 1-3 in.; secondary petiolule .1-.15 in.; ultimate petiolule minute or 0; tendrils slender, smooth, generally forked near the end. *Inflorescence* a compound umbel, or simple umbels cymosely arranged; peduncle 1.5-2 in. long, usually with several conspicuous bracts; ultimate pedicels about .2 in. long. *Flowers* 4-merous. *Stigma* sessile, flat. *Fruit* about .4 in. long, globose, 2-4-seeded, black when ripe.

Valleys in JAUNSAR and TEHRI-GARHWAL, and the OUTER HIMALAYA near Mussoorie, 3,7,000 ft., usually on trees or rocks in shady places. Also at the Robbers' Cave and elsewhere in the DUN.

Fl. Aug., Sept. Fr. Oct., Nov.

2. *Leea*, Linn.; G. P. n. 3.

Erect shrubs or herbs. *Leaves* usually alternate, simple or 1-3-pinnate, dilated at the base into a sheath. *Flowers* in leaf-opposed compound corymbose cymes. *Calyx* 5-toothed. *Petals* 5, more or less connate at the base and adhering to the staminal tube. *Stamens* 5, united at the base into a tube; free end of filaments short, reflexed. *Ovary* 3-6-celled, inserted on the disk; ovules solitary in each cell; style short.



28. SAPINDACEÆ.

CS 85

Analysis of the Species.

- Leaflets acute, glabrous ; flowers red. . . 1. *L. alata*.
Leaflets abruptly long-acuminate,
scabrous ; flowers green. . . 2. *L. aspera*.

1. ***L. alata***, Edgew. ; Fl. Br. Ind. i. 665 ; Brandis For. Flora 102 ; Revision by Mr. C. B. Clarke in Trimen's Journal of Botany, x. 101.

A large perennial herb. *Leaves* imparipinnate ; petiole grooved, winged. *Leaflets* 5-7, 6-12 by 1-2.5 in., oblong, acute, serrate, glabrous but rough with minute elevated dots, sessile or the lowest pair shortly petioluled ; lateral nerves 8-12 pairs ; base acute or rounded. *Cymes* compact, corymbosely branched, 2-3 in. across, peduncle 2-6 in. long, furrowed, rough with elevated glandular dots. *Flowers* small, red. *Anthers* united. *Fruit* 3.4 in. diam., reddish-purple, succulent.

Fairly common in the DŪN. Dehra, Lachiwāla, etc.

Fl. June, July. Fr. Sept., Oct.

2. ***L. aspera***, Edgew. ; Fl. Br. Ind. i. 665 ; Brandis For. Flora 102 ; Revision by Mr. C. B. Clarke in Trimen's Journal of Botany, x. 136. Vern. *Kawā Okhār*, Jaunsar.

A large perennial herb. *Leaves* simply imparipinnate, or the lower often bipinnate. *Leaflets* (or pinnae) 2-3 pairs, 3-6 by 2-3 in., ovate or ovate-oblong, abruptly long-acuminate, obtusely crenate, scabrous ; lateral nerves 12-16 pairs, straight ; base rounded or subcordate ; common petiole not winged, of variable length ; ultimate petiolule slender, 2.7 in. long. *Corymbs* sessile (so as to appear clustered) or shortly peduncled. *Flowers* small, green. *Anthers* not united. *Fruit* 3.4 in. diam., succulent, black when fully ripe.

Common in ravines in the DŪN. Also in JAUNSAAR up to 6,000 ft.

The ripe fruit is eaten.

Fl. June, July. Fr. Oct., Nov.

ORDER 28. SAPINDACEÆ ; G. P. N. 51.

Trees or shrubs. *Leaves* various. *Flowers* usually polygamous. *Calyx* 4-5-lobed ; lobes more or less connate. *Petals* 4-5 or 0, imbricate, often hairy at the base within. *Stamens* hypogynous, 5-10, generally 8 ; filaments often pubescent. *Disk* complete or one-sided. *Ovary* sometimes eccentric, 1-4, generally 3-celled ;



ovules 1-2 in each cell, ascending; style simple or divided, usually terminal. *Fruit* various. *Seeds* generally exalbuminous, sometimes arillate, usually with a large hilum.

Analysis of the Genera.

Flowers irregular.

(Leaves opposite, exstipulate, digitate; fruit, a leathery capsule.) 1. *ÆSCULUS*.

Flowers regular.

Leaves alternate, exstipulate.

Leaves paripinnate; fruit indehiscent.

Fruit dry; seeds in a fleshy arillus. 2. *SCHLEICHERA*.

Fruit fleshy or coriaceous; seeds not arillate 3. *SAPINDUS*.

Leaves simple; fruit a membranous capsule. 5. *DODONÆA*.

Leaves opposite, exstipulate, palmately lobed or undivided; fruit a double samara. 4. *ACER*.

Leaves opposite, stipulate, trifoliolate or pinnate; fruit an inflated membranous capsule. 6. *STAPHYLEA*.

1. *Æsculus*, Linn.; G. P. n. 21.

1. *Æ. indica*, Colebr.; Fl. Br. Ind. i. 675; Brandis For. Flora 103, t. 19; Gamble Man. Ind. Timb. 94. The Horse-chestnut tree. Vern. *Pangár*, *Bankhór*, *Kándur*, *Kandár*, Jaunsar.

A large tree with scaly buds; the old bark peeling off upwards in long thick bands. *Leaves* opposite, digitate, exstipulate, deciduous; common petiole 4-6 in. long. *Leaflets* 5-9, 6-10 by 2-3.5 in., the centre ones largest, oblanceolate or oblong, acuminate, sharply serrate, glabrous; lateral nerves 15-22 pairs, arcuate; base acute; petiolules .2 in. long; bud-scales about 1.5 in. long, oblong, membranous, glaucous. *Flowers* white, horizontal, in large thyrsoid terminal panicles. *Calyx* .2-3 in. long, tubular, with 5 short rounded lobes. *Petals* 4, the place of the 5th vacant, white and yellow, .6-.8 in. long, clawed, unequal in breadth. *Stamens* 7, filiform, curved upwards, longer than the petals; anthers versatile. *Disk* one-sided. *Ovary* sessile, 3-celled; style simple, slender. *Fruit* a 1-3-celled capsule, 1-2 in. long, ovoid, rough outside. *Seeds* about 1.25 in. diam., dark-brown, smooth, shining; hilum about .5 in. diam.

Shady ravines in JAUNSAAR and TEHRI-GARHWAL, 5,-10,000 ft. Fairly common; abundant about LOKHÁR.

Wood of a cream-colour, soft and close-grained; pores small; medullary rays very fine and numerous; weight about 35 lbs. per c. ft. It is turned into cups, dishes and platters which are used to hold milk, ghee, etc., and are in common use. The fruit is given to cattle and

goats and the embryo is eaten by the hill people ground and mixed with flour.

Fl. Apr.-June. Fr. July-Oct.

2. Schleicheria, Willd. ; G. P. n. 41.

1. **S. trijuga**, Willd.; Fl. Br. Ind. i. 681; Brandis For. Flora 105, t. 20; Gamble Man. Ind. Timb. 95. Vern. *Gausam*, *Gosum*, *Kusam*, Hind.

A large umbrageous tree; bark grey, exfoliating in plates of irregular shape, red inside. *Leaves* paripinnate, thin and of a pink colour when very young, coriaceous and dark-green when old; rachis 3-5 in. long. *Leaflets* 2-4 pairs, opposite, 2-9 by 1.5-3.5 in., oblong, elliptic, ovate or obovate, subsessile, quite entire, glabrescent, the terminal pair much the largest; main lateral nerves 12-20 pairs. *Flowers* yellowish-green polygamous, fascicled on simple or compound interrupted drooping racemes which are 3-5 in. long and crowded at the end of the branches; some trees produce only male flowers. *Calyx* cup-shaped, about 1 in. across. *Petals* 0. *Disk* complete, wavy. *Stamens* 5-8, inserted within the disk, much exceeding the calyx. *Ovary* 3-4-celled; ovules solitary in each cell; style simple; stigma 3-4-cleft. *Fruit* .6-.8 in. diam., 1-3-celled, globose, abruptly tapering to a point, dry, indehiscent. *Seeds* in a pulpy aril having an acid taste.

Somewhat scarce in the DŪN forests, except at Thāno and Sainkōt, Khairi, etc., but very common along the foot of the SAHĀRANPUR SIWALIKS, and in the LOWER HIMALAYA and HIMALAYAN valleys, e.g., Kālsi, Mālkōt, etc.

The wood is reddish-brown, very hard, and marked with white wavy concentric lines; weight about 70 lbs. per c. ft. It is used for oil and sugar mills, naves of carts, and such other purposes. The lac produced on this tree is considered to be of the finest quality. The young fruit is pickled. The seed yields a fat oil which is used to burn. The tree is lopped for fodder.

New leaves and fl. Mar., Apr. Fr. Oct, Nov.

3. Sapindus, Linn. ; G. P. n. 43.

1. **S. detergens**, Roxb.; Brandis For. Flora 107; Gamble Man. Ind. Timb. 96. Syn.—*S. Mukorossi*, Gaertn.; Fl. Br. Ind. i. 683. The Soap-nut tree. Vern. *Rithā*, Hind.

A handsome tree, somewhat resembling the Tūn; bark grey. *Leaves* alternate, paripinnate, 12-20 in. long. *Leaflets* 5-10 pairs, opposite or alternate, 3.5-6 by 1.2 in., gradually smaller towards the apex of the rachis, lanceolate, acuminate, entire, coriaceous, glabrous;



lateral nerves numerous; petiolule 1·2 in. long. *Inflorescence* terminal thyrse or a compound cymose panicle. *Flowers* small, regular, polygamous. *Calyx lobes* somewhat unequal, ciliate. *Petals* white or purplish, alternating with the calyx-lobes, ciliate. *Stamens* 8, inserted in the centre of the disk; filaments white-woolly; anthers versatile. *Ovary* usually 3-celled. *Fruit* a fleshy globose 1-seeded drupe, 7-1 in. diam.; seed smooth, black, loose inside when dry; the saponaceous covering wrinkled and somewhat translucent in the dry fruit.

Cultivated in the DŪN, as well as in JAUNSAAR, e.g., at Thádiar, Lokhár, etc.,—possibly, but very doubtfully, indigenous.

Wood light-yellow, moderately hard, compact and close-grained, weighing about 44 lbs. per c. ft. It is not used. The tree is much valued for the fruit, which is a good substitute for washing-soaps, to which it is even superior in the case of woollen or silk fabrics. The leaves are given as fodder to cattle.

Fl. May, June. Fr. Oct.-Jan.

4. *Acer*, Linn.; G. P. n. 60

The Maples.

Trees with scaly buds. *Leaves* opposite, palmately lobed or undivided. *Flowers* regular, polygamous. *Calyx* usually 5-parted, deciduous. *Petals* as many as the calyx-lobes, sometimes absent. *Disk* thick, annular, glabrous; margin lobed. *Stamens* generally 8, inserted on the disk; filaments usually longer in the male than in the hermaphrodite flowers. *Ovary* 2-lobed, laterally compressed, usually 2-celled; style deeply 2-fid. *Fruit* a double samara with membranous reticulate wings, indehiscent; seeds usually solitary.

Analysis of the Species.

Leaves undivided, margins entire.

Leaves white beneath; petiole 7-4 in. long . . . 1. *A. oblongum*.

Leaves green beneath; petiole 2-5 in. long . . . 2. *A. lævigatum*.

Leaves 5-lobed, margins serrate.

Leaves pale beneath.

(Serratures large and obtuse) . . . 3. *A. cæsium*.

Leaves green beneath (sometimes 3-lobed.)

Serratures distant, acumen short . . . 4. *A. villosum*.

Serratures close, acumen long . . . 5. *A. caudatum*.

Leaves 5-7-lobed, margins entire . . . 6. *A. pictum*.



1. **A. oblongum**, Wall.; Fl. Br. Ind. i. 693; Brandis For. Flora 110; Gamble Man. Ind. Timb. 99. Vern. *Pángoi*, *Parángá*, *Jaunsar*; *Kirmolá*, *Kirmoli*, Garhwal.

A middle-sized tree; bark grey, smooth, with horizontal wrinkles; stem often irregularly buttressed at the base. *Leaves* 2·5-6 by 7·2-5 in., oblong or ovate-lanceolate, acuminate, entire, glaucous beneath; lateral nerves 6-8 pairs; base rounded, rarely subacute, 3-nerved; petiole 7-4 in. long, terete, flexuose. *Flowers* pentamerous, in terminal or leaf-bearing lateral corymbose panicles; pedicels and calyx hairy. *Sepals* and *petals* 1 in. long, linear-oblong. *Stamens* 8, exserted, glabrous. *Ovary* hairy. *Fruit* glabrous; nuts more or less angular; wings 1 in. long, contracted at the base, divergent, almost straight at the back.

OUTER HIMALAYA and HIMALAYAN valleys up to 6,500 ft., e.g., Málköt hills, Tons valley, ravines below Mohná, etc. Also in marshy localities in the DÚN such as Nakraunda, Lachiwála, Mothronwála, etc.

Wood light reddish-brown, moderately hard, close-grained, weighing about 45 lbs. per c. ft. It is used for agricultural implements and made into drinking cups.

Fl. Feb.-Apr. Fr. Rainy season.

2. **A. lævigatum**, Wall.; Fl. Br. Ind. i. 693; Brandis For. Flora 110; Gamble Man. Ind. Timb. 99.

A fairly large tree with yellowish or ash-coloured smooth bark; stem often irregularly buttressed. *Leaves* 2·5-5 by 1-2 in., oblong, acuminate, entire or obscurely sinuate, coriaceous, glabrous, strongly reticulate, green beneath; main lateral nerves about 6 pairs, the basal pair faint and intramarginal; base rounded or more or less acute; petiole 2·5 in. long, channelled. *Flowers* in lax terminal panicles. *Sepals* 5, ovate, smaller than the petals. *Petals* white, about 1 in. long, obovate, clawed. *Stamens* 5-8, exserted, glabrous. *Ovary* hairy. *Fruit* glabrous; nuts ovoid, not angular; wings 6-1 in. long, divergent, tinged with red until mature, back straight.

MUSSOORIE in valleys at 6,700 ft.; scarce.

Wood white, shining, hard and close-grained, weighing 43 lbs. per c. ft. It is used for building in Nepal and for tea-boxes in Assam.

Fl. Mar., Apr. Fr. July, Aug.

3. **A. cæsium**, Wall.; Fl. Br. Ind. i. 695; Brandis For. Flora 111, t. 21; Gamble Man. Ind. Timb. 100. Vern. *Kainju*, *Bara Kainju*, *Kainjal*, Jaunsar.

A large handsome deciduous tree; stem generally rough with knotty excrescences known as burrs; bark grey, exfoliating in thin vertical strips. *Bud-scales* 1·5-2 by 3·5 in., reddish, white-pubescent.



Leaves 3-6 in. diam., rather broader than long, 5-lobed, cordate, serrate, pale beneath, generally bright-red, especially when young; petiole 3-5 in. long, rather stout, flattened at the base. *Flowers* yellowish, in cymosely branched terminal corymbs, appearing with the leaves. *Petals* small, cream-coloured. *Stamens* short, longer on male trees. *Fruit* glabrate; nuts gibbous; wings 1.5-2 in. long, slightly divergent, or in some forms erect and overlapping at the inner edges; back somewhat curved.

HIMALAYAN FORESTS from 6,000-10,000 ft., fairly common, generally in open places like grazing grounds.

Wood whitish, close-grained, soft or moderately hard; weight 40 lbs. per c. ft. It is scarcely used excepting that the burrs are sometimes made into cups.

New leaves and fls. Apr., May. Fr. July-Oct.

4. **A. villosum**, Wall.; Fl. Br. Ind. i. 695; Brandis For. Flora 111; Gamble Man. Ind. Timb. 100. Vern. *Kainju*, Jaunsar.

A fairly large deciduous tree with thin grey bark scarcely rough. *Leaves* 4-6 in. diam., generally as long as broad, 5-lobed or by suppression 3-lobed, cordate, irregularly dentate, deep-green, young with silky hairs beneath; petiole 2.5-5 in. long, rather stout. *Flowers* 5-merous, in compound lateral racemes, appearing before the leaves; peduncles and pedicels stout, hairy. *Sepals* about 1 in. long, oblong, ciliate, 3-nerved. *Petals* about as long as the sepals but narrower, also ciliate. *Stamens* 5-8, exserted, glabrous. *Fruit* generally rusty-villous; nuts quadrant-shaped, 3-4 in. long; wings 2 by .8 in., divergent, incurved at the back, membranous at the inner edge.

JAUNSAR and TEHRI-GARHWAL, 7,000 ft.; Deoban, Konáin, Mundáli, Deotá, etc.

Wood white, moderately hard, close-grained, beautifully mottled; weight 38 lbs. per c. ft. It is seldom used except for fuel. The leaves are lopped for fodder.

Fl. Feb., Mar. Fr. June-Aug.

5. **A. caudatum**, Wall.; Fl. Br. Ind. i. 695; Brandis For. Flora 112; Gamble Man. Ind. Timb. 100. Vern. *Kainjli*, *Kanjla*, Jaunsar.

A sparingly branched moderate-sized deciduous tree; bark dark-grey, on young stems and branches dark-green or greenish-red, quite smooth. *Leaves* 2.5-5 by 2-3.5 in., 5-lobed, the two outer lobes smaller than the rest or absent; lobes caudate-acuminate, pointedly serrate to within .5 in. of the tip of the narrow acumen which is 1.5-2.5 in. long; petiole 2-4 in. long, flattened and subamplexicaul at the base. *Flowers* in terminal and lateral racemes, appearing shortly after the leaves; pedicels 1-2 in. long, very slender. *Sepals* 2 in. long, oblong,

whitish, clawed. *Petals* somewhat shorter than the sepals, white, obovate, 4-6, exserted. *Fruit* glabrous; nuts irregularly grooved or pitted; wings about 1 in. long, erect or divergent, membranous except at the outer edge, undulate at the inner edge.

JAUNSAR and TEHRI-GARHWAL, 8,-11,000 ft.: Deoban, Konáin, Deotá, etc.; generally affecting open ravines in shady aspects.

Wood whitish, compact and moderately hard, seldom used; weight 43 lbs. per c. ft.

Fl. Mar., Apr. Fr. July-Sept.

6. **A. pictum**, Thunb.; Fl. Br. Ind. i. 696; Brandis For. Flora 112; Gamble Man. Ind. Timb. 101. Vern. *Kainchli*, *Kabási*, *Dúdh Kainju*, Jaunsar.

A moderate-sized handsome tree with thin grey bark. *Leaves* 2.5 by 2.5-7 in., broader than long, 5-7-lobed, rather membranous, glabrous; margins quite entire; base usually deeply cordate, rarely truncate; petiole 1-6 in. long, slender, flexuous. *Flowers* glabrous, on slender pedicels arranged in terminal or lateral corymbs. *Sepals* about 1 in. long, oblong. *Petals* as long as the sepals, spatulate. *Stamens* 8, shorter than the petals. *Fruit* glabrous; nuts thin; wings 1-1.3 in. long, very divergent, with the back sigmoidly curved.

JAUNSAR and TEHRI-GARHWAL, 5,-9,000 ft., the most common of all high-level maples.

Wood white, moderately hard and close-grained, used for ploughs, bedsteads, etc. Tibetan drinking-cups are made of the knotty excrescences (burs).

Fl. Apr., May. Fr. June, July.

5. *Dodonaea*, Linn.; G. P. n. 63.

1. **D. viscosa**, Linn.; Fl. Br. Ind. i. 697; Brandis For. Flora, 113; Gamble Man. Ind. Timb. 101. Vern. *Sonátta*, *Waláyti Mehndi*, Hind.

An evergreen shrub with glabrous red branchlets. *Leaves* alternate, simple, exstipulate, subsessile, 1.5-3 by .2-1 in., oblanceolate to linear-cuneate, coriaceous, glabrous, shining above, more or less viscid with a yellow resin (whence the specific name); lateral nerves numerous, not very prominent. *Inflorescence* a short terminal panicle with racemose branches. *Flowers* polygamous, about .2 in. across. *Sepals* usually 5, about .1 in. long, oblong, greenish-yellow. *Petals* 0. *Stamens* generally 8, inserted on the outer side of the disk; filaments short; anther-cells comparatively large. *Ovary* 3-4-celled, with 2 ovules in each cell; style 3-4-cleft at the apex. *Fruit* a compressed capsule, septicidally 2-4-valved, each valve with an oblong membranous wing which is about .5 by .3 in.



LOWER HIMALAYA about 4,500 ft. Cultivated in the DŪN and SAHARANPUR DISTRICTS in hedges round gardens and railway-platforms.

Wood hard, compact and close-grained, capable of being used for engraving. The branches are used to support the earth of flat roofs. "The shrub grows readily from seed without much water in arid places"—*Sir D. Brandis*; and "is likely to be important in reclothing denuded tracts."—*Mr. J. S. Gamble*. It makes an excellent hedge.

Fl. Aug.-Feb. Fr. Jan.-June.

6. *Staphylea*, Linn. ; G. P. n. 71.

1. **S. Emodi**, Wall.; Fl. Br. Ind. i. 698; Brandis For. Flora 114; Gamble Man. Ind. Timb. 101. Vern. *Chitrā*, *Mārchkhob*, Jaunsar; *Nāgdāun*, Hind.

A large shrub; bark with grey and dark-brown reticulate streaks. *Leaves* 3-foliolate. *Leaflets* 3-6 by 1·5-3 in., ovate or elliptic, acuminate, closely serrate, membranous, white-pubescent beneath when young, the lateral very shortly petioluled or sessile, often somewhat oblique; main lateral nerves 6-8 pairs; common petiole 3-6 in., petiolule of the terminal leaflet 1·5-2 in. long; stipules and stipels caducous. *Flowers* 2-sexual, regular, 5-merous, 1·5 in. long, in dense pendulous cymes. *Sepals* and *petals* similar, white, erect. *Disk* 5-lobed. *Stamens* 5, inserted between the lobes of the disk. *Ovary* 2-3-celled; styles 2-3, more or less connate. *Fruit* an inflated membranous capsule, 2-3 in. long, 3-lobed, 3-celled; cells tapering to a tail, dehiscing from the apex.

Shady ravines in the HIMALAYA, 5,000 to 9,000 ft.: Jhālkūri, Mundāli, Kathiān, Deotā, Lambātāch, etc.

Wood white, soft, weighing about 44 lbs. per c. ft. Walking-sticks are made of the long straight branches with the bark unstripped, which, if cut on a Sunday and not shod with iron, are believed to have the property of keeping off snakes.

Fl. Apr., May. Fr. July, Aug.

To this Order belongs the Lichi, *Nephelium Litchi*, Camb.; Fl. Br. Ind. i. 687; which is commonly cultivated in the DŪN and yields an excellent fruit. Vern. *Līchi*, Hind.—G. P. n. 47.

ORDER 29. SABIACEÆ ; G. P. n. 52.

Climbing or erect shrubs, or trees. *Leaves* alternate, exstipulate, usually simple. *Flowers* small, 1-2-sexual,



Generally in panicles. *Calyx* 4-5-cleft; lobes imbricate. *Petals* 4-5, imbricate, sometimes unequal. *Stamens* 4-5, inserted below the ovary and opposite to the petals. *Disk* small, annular. *Ovary* 2-5-celled, compressed or lobed; ovules 1-2 in each cell; styles 2-3, free or connate. *Fruit* a drupe; seeds with a broad hilum.

Analysis of the Genera.

- Climbers. Petals and stamens equal, the latter all fertile 1. SABIA.
Trees. Petals and stamens unequal, only 2 stamens fertile 2. MELIOSMA.

1. *Sabia*, Colebr.; G. P. n. 1.

Scandent shrubs. *Leaves* simple, entire. *Flowers* usually 2-sexual, solitary or in cymes or panicles, each subtended by a pair of opposite bracts. *Calyx-lobes* and *petals* 4-5, equal. *Stamens* 4-5, all fertile. *Disk* 4-5-lobed. *Ovary* 2-lobed; styles 2, more or less cohering. *Fruit* of 1 or 2 dry carpels.

Analysis of the Species.

- Flowers large, solitary or fascicled . . . 1. *S. campanulata*.
Flowers small, in large panicles. . . . 2. *S. paniculata*.

1. ***S. campanulata***, Wall.; Fl. Br. Ind. ii. 1; Brandis For. Flora 116.

A climber with woody branches. *Leaves* 1-3.5 by .4-1.3 in., oblong-lanceolate, acuminate, membranous, soft, puberulous, pale beneath; nerves reticulate; petiole .2-.6 in. long, channelled, ciliate. *Flowers* .5 in. across, green or pale-yellow with a dash of purple, usually solitary in the axils of the leaves; peduncle 1-2 in. long. *Sepals* minute. *Petals* .2-.3 in. long, orbicular, enlarging in fruit. *Stamens* included. *Fruit* .3-.4 in. diam., of two distinct turquoise-blue compressed reniform carpels; seeds rugose.

JAUNSAR and TEHRI-GARHWAL, 5, 10,000 ft., in shady places common, though not prevalent.

Fl. Apr., May. Fr. Rainy season.



29. SABIACEÆ.

[*Sabia*.]

2. ***S. paniculata***, Edgew.; Fl. Br. Ind. ii. 3; Brandis For. Flora 117.

A large climber with a dark-grey stem. *Leaves* 3-8 by 1·3-3 in., oblong-lanceolate, acuminate, tough, coriaceous, dark-green and shining above, pale and strongly reticulate beneath; main lateral nerves 6-8 pairs; base rounded; petiole 4-7 in. long. *Flowers* yellowish, 15-2 in. across, in large lateral often leaf-bearing panicles; pedicels hairy. *Drupe* 3 in. diam., orbicular, compressed.

Shady swampy places in the DŪN such as Mothronwāla, Gularghāti, Kāluwāla, Nakraunda, etc.

Fl. Feb., Mar. Fr. June-Aug.

2. *Meliosma*, Blume; G. P. n. 2.

Trees or erect shrubs usually with hairy extremities. *Leaves* simple, rarely pinnate. *Flowers* minute, in large thyrsoid panicles. *Sepals* and *petals* 4-5, unequal. *Stamens* generally 5, two fertile and adnate to the smaller petals, the rest without anthers. *Disk* 4-5-toothed. *Ovary* sessile, usually 2-celled. *Fruit* a drupe, obliquely globose, with a hard kernel; seed solitary.

Analysis of the Species.

- | | |
|---|-----------------------------|
| Leaves soft, lateral nerves close and straight;
flowers pedicellate. | 1. <i>M. dillenifolia</i> . |
| Leaves hard, lateral nerves distant and arcuate;
flowers sessile. | 2. <i>M. pungens</i> . |

1. ***M. dillenifolia***, Bl.; Fl. Br. Ind. ii. 4; Brandis For. Flora 115; Gamble Man. Ind. Timb. 103. Vern. *Goi*, Jaunsar.

A small deciduous tree; young parts covered with rusty pubescence; bark ashy-grey. *Leaves* 4-12 by 2-5 in., obovate or elliptic, abruptly acuminate, cuspidate-serrate, membranous, rough with minute raised dots above, rusty-pubescent beneath; lateral nerves 15-20 pairs, straight and parallel; base acute; petiole 5-1 in. long. *Flowers* 2-sexual, bracteate, in large lax terminal panicles which extend downwards with branches at the axils of the upper leaves. *Sepals* 5, ciliate, the two outer smaller. *Petals* 5, orbicular, white, the two

attached to the stamens smaller. *Drupe* 1 in. diam., globose, black when ripe.

JAUNSAAR and TEHRI-GARHWAL, up to 10,000 ft., in shady ravines; common in the Bájámára and Konáin Blocks.

Wood dull-white, soft, coarse-grained, used only for fuel.

Fl. May-July. Fr. Aug.-Oct.

2. *M. pungens*, Wall.; Fl. Br. Ind. ii. 4; Brandis For. Flora 116. Vern. *Búshkuá*, *Bushá*, Jaunsar; *Khárás*, Garhwal.

A small tree with grey bark; young parts covered with rusty pubescence. *Leaves* 5-10 by 1.3 in., oblanceolate, abruptly long-acuminate, very distantly cuspidate-serrate, hard, coriaceous, pubescent beneath along the midrib and nerves; lateral nerves 8-10 pairs, arcuate, prominent beneath; base very gradually narrowed; petiole 2-7 in. long. *Flowers* small, sessile, in large compact panicles, supported by 1 or 2 bracteoles which resemble the sepals. *Sepals* round, ciliate. *Petals* membranous, whitish. *Drupe* 3 in. diam., globose.

JAUNSAAR and TEHRI-GARHWAL, 4,800 ft., generally in ravines and along streams. Lokhár, the Ámláwa and Tons valleys, etc.

Wood soft, of no special value.

Fl. May, June. Fr. July, Aug.

ORDER 30. ANACARDIACEÆ; G. P. N. 53.

Trees or shrubs, generally with milky or resinous juice. *Leaves* usually alternate, simple trifoliolate or pinnate, exstipulate. *Inflorescence* generally a terminal panicle, less frequently lateral or axillary. *Flowers* small, mostly regular, unisexual or bisexual. *Calyx* 3-5-cleft. *Petals* free, as many as the calyx-divisions and alternating with them, sometimes absent. *Disk* usually annular. *Stamens* generally as many as the petals, inserted under (rarely on) the disk, sometimes not all perfect. *Ovary* superior or half-inferior, usually 1-celled and 1-seeded. *Fruit* a drupe. *Seed* exalbuminous.



30. ANACARDIACEE.

Rhus.
SL

Analysis of the Genera.

Fruit 1-celled, 1-seeded.

Pericarp dry.

(Leaves simple or compound, petals 4-6) . 1. *RHUS*.

Pericarp more or less fleshy.

Leaves simple.

Receptacle of fruit enlarged and fleshy. . 6. *SEMECARPUS*.

Receptacle of fruit not enlarged or fleshy.

Stamens 1-5, generally only 1 perfect. . 3. *MANGIFERA*.

Stamens 8-10, all perfect . . 4. *BUCHANANIA*.

Leaves pinnate.

Petals none. 2. *PISTACIA*.

Petals 4-5. 5. *ODINA*.

Fruit 2-5-celled, 2-5-seeded; leaves imparipinnate . 7. *SPONDIAS*.

1. *Rhus*, Linn. ; G. P. n. 1.

Trees or shrubs with a resinous or acrid juice. *Leaves* 3-foliolate or pinnate, rarely simple. *Flowers* small, polygamous, paniced. *Calyx-limbs* 4-6. *Petals* 4-6, imbricate. *Disk* fleshy, annular. *Stamens* 4-10, inserted at the base of the disk. *Ovary* sessile, 1-celled; styles 3. *Drupe* dry, with a pendulous seed.

Analysis of the Species.

Leaves simple 1. *R. Cotinus*.

Leaves 3-foliolate 2. *R. parviflora*.

Leaves imparipinnate.

■ Petiole winged 3. *R. semi-alata*.

Petiole not winged.

Leaflets sessile; inflorescence terminal . 4. *R. punjabensis*.

Leaflets short-petiolulate; inflorescence axillary 5. *R. Wallichii*.

1. ***R. Cotinus***, Linn. ; Fl. Br. Ind. ii. 9; Brandis For. Flora 118; Gamble Man. Ind. Timb. 104. Vern. *Tung*, *Tungoi*, *Jaansar*; *Tungá*, Garhwal.

A shrub or small tree with thin reddish-brown bark; branchlets red; young parts grey-tomentose. *Leaves* simple, 2-4 by 1.5-3 in., ovate elliptic obovate or orbicular, entire, usually tomentose beneath, less frequently so above; main lateral nerves 10-15 pairs; base more or less acute; petiole 1.5-3 in. long. *Flowers* about 1.5 in. diam.,



on very slender pedicels which are arranged in lax terminal panicles, pedicels of sterile flowers elongated and feathery. *Sepals* linear; oblong. *Petals* elliptic, pale-yellow, much exceeding the sepals. *Filaments* short; anthers comparatively large. *Disk* broad, 4-angled. *Drupe* .2 in. long compressed, oblique, reddish, covered with white hairs.

Common in JAUNSAK, TEHRI-GARHWAL and OUTER HIMALAYAN slopes, 3-6,000 ft., generally in open sunny places.

Heartwood of a dark yellow colour and mottled, weighing 56 lbs. to the c. ft. It makes very pretty picture-frames and might be used for cabinet-work. The twigs are used for basket-making, and the bark and leave for tanning. The leaves and flowers emit the characteristic resinous odour of mango when bruised.

New leaves and fls. Apr., May. Fr. Autumn.

2. *R. parviflora*, Roxb.; Fl. Br. Ind. ii. 9; Brandis For. pra 119. Vern. *Ninás*, *Nináwa*, Jaunsar; *Túnglá*, Hind.

A shrub; young parts densely covered with rusty tomentum; bark grey, smooth. *Leaves* 3-foliolate; common petiole 1-2 in. *Leaflets* 1-3 by .6-2 in.,—the terminal much larger than the other two, —obovate, crenate, sparsely hairy above, pubescent beneath; the terminal leaflet often narrowed into a margined petiolule, others sessile; lateral nerves 8-12 pairs, straight, prominent. *Inflorescence* a terminal panicle with racemose branchlets, some of which rise from the axils of the upper leaves. *Flowers* .1 in. across. *Sepals* ovate. *Petals* oblong, longer than the sepals. *Drupe* .2 in. diam., ovoid, glabrous, brown, shining.

JAUNSAK, TEHRI-GARHWAL and the OUTER HIMALAYA, 2-5,000 ft.: Dhárágádh, Tons (Tiuni, Morá Depôt, etc.) and Jumna valleys; Málkôt, etc.

Wood hard and close-grained. The fruit is eaten, and is used in Hindu medicine.

Fl. May, June. Fr. July, Aug.

3. *R. semi-alata*, Murray; Fl. Br. Ind. ii. 10; Brandis For. Flora 119; Gamble Man. Ind. Timb. 105. Vern. *Tibri*, *Arkhoi*, Jaunsar.

A small deciduous tree; young parts covered with dark-grey pubescence. *Leaves* imparipinnate, over a foot long, turning red before falling; common petiole usually winged. *Leaflets* 4-6 pairs, opposite, sessile, 2-4 by 1-2 in., elliptic, acuminate, deeply crenate or dentate, glabrous above, soft-tomentose beneath; lateral nerves 10-15 pairs, parallel; base rounded, somewhat oblique. *Panicles* terminal, 6-8 in. long, conical, dense-flowered. *Flowers* .1 in. diam., pale-green. *Sepals*



30. ANACARDIACEÆ.

GL
[Rhus.]

ovate. *Petals* oblong, ciliate, much exceeding the sepals. *Drupe* '2 in. diam., subglobose, compressed.

JAUN SAR and TEHRI-GARHWAL, 3,7,000 ft. : Dhārágádh and Tons valleys.

Wood soft, shining, white with darker streaks, weighing about 27 lbs. per c. ft., not used. The fruit is often eaten by the hill people, and is used medicinally.

New leaves and fls. Apr., May. Fr. Aug.-Oct.

4. **R. punjabensis**, Stewart; Fl. Br. Ind. ii. 1t; Brandis For. Flora 120; Gamble Man. Ind. Timb. 105. Vern. *Titi*, *Titroi*, Jaunsar.

A small deciduous tree with rough dark-grey bark and aromatic leaves; young parts covered with short pubescence. *Leaves* imparipinnate, over a foot long; petiole and rachis slender, not winged. *Leaflets* 5-6 pairs, opposite or subopposite, sessile, 3-6 by 1-2.5 in., ovate-oblong or lanceolate, acuminate, entire or serrate near the apex, membranous, pubescent beneath, with scattered hairs above; lateral nerves about 20 pairs, very slender; base rounded. *Panicles* terminal, compact, much shorter than the leaves. *Flowers* less than 1 in. diam., yellowish-green. *Drupe* about 2 in. diam., on short pedicels, compressed, covered with a dense purplish tomentum.

JAUN SAR and TEHRI-GARHWAL, 3,8,500 ft., towards the interior; e.g., Lokhár, Kathián, Deotá, etc.

Fl. Apr., May. Fr. Aug., Sept.

5. **R. Wallichii**, Hook. f.; Fl. Br. Ind. ii. 11; Gamble Man. Ind. Timb. 106. Syn.—*R. vernicifera*, DC.; Brandis For. Flora 120. Vern. *Árkhoi*, *Árchoi*, Jaunsar.

A small deciduous tree somewhat resembling the walnut, with smooth grey bark which exudes a black acrid varnish; young parts covered with rusty-brown or ash-coloured tomentum. *Leaves* imparipinnate, approximate near the ends of the branches; common petiole terete, stout. *Leaflets* 3-5 pairs, opposite, subsessile, 4-6 by 2-3.5 in., oblong-elliptic, acuminate, entire, grey-tomentose beneath, more or less pubescent above; lateral nerves 20-25 pairs; base rounded, oblique. *Panicles* short, compact, from the axils of the lower or last year's leaves. *Flowers* subsessile, 1 in. diam. *Sepals* obtuse. *Petals* much larger than the sepals, obovate, greenish-white, with dark veins. *Drupe* '3 in. diam., much crowded together; pericarp dry, splitting irregularly to form a stellate receptacle for the kernel which is long-persistent and covered with a vegetable wax.

JAUN SAR and TEHRI-GARHWAL 4,7,000 ft.; Binálgádh, Dhārágádh, Kathián, Tons valley, etc.

Sapwood white, soft; heartwood reddish-brown. It is used for saw frames and axe-handles. The juice of the leaves is corrosive. "In Jaunsar Bawar it is rubbed on thread to strengthen it"—(Sir D. Brandis)—but the Jaunsaris have a superstition against the tree, which is said to be inhabited by an evil spirit, and consequently they most scrupulously avoid touching it or going near it.

Fl. May, June. Fr. July-Sept.

2. *Pistacia*, Linn.; G. P. n. 53.

1. *P. integerrima*, Stewart; Fl. Br. Ind. ii. 13; Brandis For. Flora 122; Gamble Man. Ind. Timb. 106. Vern. *Kakkar*, *Kākroi*, Jaunsar.

A middle-sized deciduous tree with rough grey bark. *Leaves* ternate, pari- or imparipinnate, 6-9 in. long. *Leaflets* 4-6 pairs, opposite, minutely petioluled, 3-6 by 1-1.7 in., lanceolate, long-acuminate, entire, hard, coriaceous, glabrous; main lateral nerves about 20 pairs, slender; base oblique. *Inflorescence* a lateral panicle. *Flowers* small, apetalous, dioecious. *MALE FLS.*: panicles 2-4 in. long, compact, pubescent; *calyx* gamosepalous, 3-5-fid; *stamens* 5-7 on a small disk; *anthers* large, red. *FEM. FLS.*: panicles 6-10 in. long, lax, thyrsoïd; *sepals* 4, free, linear, deciduous; *ovary* sessile, 1-celled; *styles* 3, cohering only near the base. *Drupe* .25 in. diam.; broader than long, glabrous, rugose.

JAUNSAAR and TEHRI-GARHWAL, also the MĀLKŌT HILLS, 3,600 ft. Āmlāwa nālā, Binālgādh, Tons valley, etc.

Sapwood white; heartwood mottled with yellow and green streaks, very hard and durable, valued as an ornamental wood; weight 54 lbs. per c. ft. "The leaves are lopped for fodder for buffaloes and camels, and the galls are used in native medicine."—Mr. J. S. Gamble.

New leaves and fls. Mar.-May. Fr. June-Oct.

3. *Mangifera*, Linn.; G. P. n. 7.

1. *M. indica*, Linn.; Fl. Br. Ind. ii. 13; Brandis For. Flora 125; Gamble Man. Ind. Timb. 107. The Mango tree. Vern. *Ām*. Hind.; *Āmbi*, Dūn and Sahāranpur (vulgar).

A large evergreen tree with rough, thick, dark-grey bark. *Leaves* alternate, simple, crowded at the ends of the branches, 6-12 by 1.5-4 in., oblong- or obovate-lanceolate, entire, coriaceous, dark-green, glabrous; margins often wavy; lateral nerves numerous, arcuate; base acute; petiole 1-2.5 in. long, swollen at the base. *Inflorescence* a terminal panicle about 1 ft. long; bracts elliptic, concave. *Flower* about .15 in. across, yellowish-green, scented, male and



30. ANACARDIACEÆ.

[*Mangifera*.]

2-sexual on the same panicle. *Calyx* 4-5-partite; segments imbricate, ovate, concave, deciduous. *Petals* 4-5, imbricate, much longer than the calyx-segments, ovate, yellow, with 3-5 longitudinal ridges. *Disk* fleshy. *Stamens* 4-5, inserted on the disk, only one perfect and longer than the rest; filaments subulate. *Ovary* sessile, obliquely ovoid, glabrous; ovule solitary, pendulous; style lateral. *Drupe* 2-6 in. long, ovoid, laterally compressed, with a protuberance on one side near the tip indicating the position of the style; putamen fibrous.

Cultivated and almost wild in SAHĀRANPUR and the DŪN. Several varieties are recognized under cultivation which differ chiefly in the quality of the fruit.

No distinct heartwood and sapwood. Wood grey, coarse-grained, soft, liable to attacks of insects; weight 41 lbs. per c. ft. It is made into planks, and is as yet the only wood used for tea-boxes in the DŪN. Doors and windows and sometimes cheap furniture are made of. The tree is, however, valued chiefly for its fruit. The green fruit pickled, and dried in slices is an article of trade in Bengal and elsewhere. The pulp of the ripe fruit is dried in thin plates, which can then be kept for months without losing flavour. Throughout the North-Western Provinces the kernel of the fruit is dried and pounded into a meal, which is used by the poorer classes during famine as a substitute for wheat-flour.

Fl. Mar., Apr. Fr. June, July.

4. *Buchanania*, Roxb.; G. P. n. 11.

1. *B. latifolia*, Roxb.; Fl. Br. Ind. ii. 23; Brandis For. Flora 127; Gamble Man. Ind. Timb. 109. Vern. *Piyāl* or *Pidāl*, Hind.; *Kath Bhilāwa*, DŪN.

A moderate-sized tree, almost evergreen; bark dark-grey or black, furrowed into thick small quadrangular plates, reddish inside. *Leaves* alternate, simple, 6-10 by 2-3.5 in., oblong or elliptic, entire, obtuse at both ends, coriaceous, hard, generally pubescent beneath, closely reticulate; lateral nerves 15-20 pairs, stout, nearly straight; petiole 2-3 in. long, pubescent. *Flowers* 2-sexual, sessile, 1.5-2 in. diam., greenish-white, in terminal and axillary pyramidal panicles. *Calyx* 5-toothed, persistent. *Petals* 5, oblong. *Disk* fleshy, 5-lobed. *Stamens* 10, as long as the petals. *Carpels* 5, hairy, inserted at the base of the disk, 1 perfect, 4 reduced to filaments. *Drupe* 5 in. long, ovoid-oblong, black when ripe; stone hard, 2-valved; seeds oily.

Common in the Sāl forests of the DŪN and SAHĀRANPUR DIVISIONS, where the soil is at all clayey. Scarce in the E. DŪN beyond the Sōng river.

Fr. Feb., Mar. Fr. May, June.

1. **O. Wodier**, Roxb.; Fl. Br. Ind. ii. 29; Brandis For.
Flora 123; Gan. Man. Ind. Timb. 110. Vern. *Jhinghan*, Hind.

Sapwood white and soft; heartwood scanty, red when fresh-cut, afterwards reddish-brown, moderately hard and close-grained, but not durable; weight 50-60 lbs. per c. ft. A useful gum exudes from wounds made in the wood, for which the tree is tapped on a regular rotation in the Saháranpur Division. The leaves are greedily eaten by cattle, and elephants are fond of the young shoots. The tree can be most easily propagated by cuttings.

Fl. Mar., Apr. Fr. June, July.



SL

6. Semecarpus, Linn. fil.; G. P. n. 25.

1. **S. Anacardium**, Linn. fil.; Fl. Br. Ind. ii. 30; Brandis For. Flora 124; Gamble Man. Ind. Timb. 111. The Marking-nut tree. Vern. *Bhilawa*, Hind.

A moderate-sized deciduous tree with rough dark-brown bark which yields an acrid juice; young parts, leaves beneath, and inflorescence pale-tomentose. Leaves crowded at the extremities of the branches, alternate, simple, 9-24 by 5-14 in., obovate-oblong, obtuse, entire, rather coriaceous, more or less hispidly pubescent, pale beneath; tip and also the base rounded, or the latter sometimes cordate; lateral nerves 16-24 pairs, stout, slightly arching. Flower polygamous or dioecious, 2-3 in. diam., in fascicles on peduncles; bracts lanceolate. Calyx 5-cleft; segments large terminal. Petals 5, oblong, glabrous, greenish-yellow, much longer than the sepals. Disk broad, annular. Filaments subulate. Stamens 3. Drupes 1 in. long, the shape of a mango, compressed, shining black when ripe, seated on an orange-coloured fleshy receptacle formed by the disk, the base of the calyx and the extremity of the peduncle.

Fairly common in the Sal forests of the Saharanpur Divisions, generally on clayey soil and in the localities.

Sapwood and heartwood not distinct. Sapwood is soft and light, weighing about 35 lbs. per c. ft.; not cup of the ring. Fruit is eaten raw, dried or roasted. The juice which is used as marking-ink and in medicine contains an acrid principle.

Leafless Feb.-Apr. New leaves May. Fruit May, June. Nov.-Feb.

7. Spondias, Linn.; G. P. n. 34.

1. **S. mangifera**, Willd.; Fl. Br. Ind. ii. 42; P. Flora 128; Gamble Man. Ind. Timb. 112. The *Ambára*, Hind.

A deciduous tree with smooth grey bark, exfoliating in part which has a characteristic aromatic smell. Leaves alternate, imparipinnate, 12-18 in. long. Leaflets 9-11, opposite, short-petiolulate, 3-9 by 1.5-4 in., oblong-elliptic, acuminate, entire, soft, rather membranous, quite glabrous, turning bright-yellow before falling; lateral nerves 10-30 pairs, straight, parallel, nearly transverse, joined by a strong intra-marginal nerve. Flowers 2 in. diam., polygamous, nearly sessile, in spreading terminal panicles. Calyx 5-toothed, deciduous. Petals 5, about 1 in. long, oblong, greenish-white, spreading. Disk cupular, crenate. Stamens 10, inserted below the disk; filaments subulate, shorter than the petals; anthers versatile. Ovary sessile, free; carpels



31. CORIARIEÆ.

103

4-5, distinct in flower, coalescing into a single stone in fruit; ovules solitary, pendulous: styles as many as the carpels. *Drupe* 1.5-2 in. long, ovoid or oblong, fleshy smooth, yellow when ripe; putamen fibrous outside and pitted with cavities through which, however, usually one only is present.

Fairly common in the Tons valley, Jaunsar, IWA.

Wood soft, light grey, in sections, per c. ft.; useless even as fuel and the holes made by them ex. The fruit is eaten when ripe, or green and tender. The buds also. The tree can be very easily propagated by planted in hedgerows.

Leafless Dec.-Apr. Fl. Mar.-May. Fr.

ORDER 31. CORI. G. P.

Glabrous erect shrubs with quadrangular leaves opposite or in whorls of three, simple or less entire, exstipulate. Flowers small, green or polygamous, usually in axillary racemes. Petals smaller than the sepals, fleshy spreading, sometimes adnate to every second stamen within, sometimes adnate to every second stamen crescent in fruit. Disk none. Stamens 10, hypogynous; filaments short. Carpels 5-10, free, 1-ovule solitary, pendulous; styles fleshy, feathery. Fruit of 5-10 compressed nuts, encircled by the petals; seeds compressed.

1. Coriaria, Linn.; G. P. n. 1.

1. *C. nepalensis*, Wall.; Fl. Br. Ind. ii. 44; Brandis For. Flora 128; Gamble Man. Ind. Timb. 113. The Mussoorie-berry. Vern. *Mansuri*, *Masuri*, Mussoorie; *Mosroi*, Jaunsar; *Gangeru*, Gangra, Tons valley.

A large shrub with long spreading branches; bark reddish-brown, rough; branchlets quadrangular. Leaves 2-4 by 1-2.5 in, ovate-oblong, cordate, acuminate, obscurely serrulate, 3-7-nerved at the



31. CORIARIEÆ.

[*Coriaria*. **SL**

base, sometimes puberulous beneath; petiole 0·1 in. long. *Racemes* 2-6 in. long, usually clustered. *Flowers* 3 in. diam., greenish-yellow. *Fruit* 2·3 in. diam., dark-brown or black.

JAUNSAK and TEHRI-GARHWAL, 4,800 ft., fairly common among shrubby vegetation on hill-sides and in ravines. Occasionally in the SAHÁRANPUR SJWALIKS, e.g. Chilláwáli Ráú.

Wood grey, hard, beautifully mottled, and takes a good polish; weight 47lbs. per c. ft. It is fit to be used for picture-frames and other small articles. The branches are browsed by sheep and goats.

Fl. Apr., May. Fr. June, July.

32. MORINGEÆ; G. P. N. 55.

trees with corky bark and soft spongy alternate, imparipinnately twice or thrice caulets opposite, entire, caducous. *Inflores-* cillary panicle. *Flowers* 2-sexual, irregular, pink. *Calyx* cup-shaped, with 5 deciduous segments. *Petals* unequal, erect, spreading. *Perfect stamens* 5, opposite to the calyx-tube. *Stamens* 5, alternating with 5 antherless filaments, inserted on the edge of the disk. *Ovary* stipitate, 1-celled; ovules numerous, on parietal placentas; styles slender, tubular. *Fruit* a pod-like capsule, rostrate, 3-angled, 3-valved. *Seeds* many; corky, usually winged.

1. *Moringa*, Lamk.; G. P. n. 1.

1. *M. pterygosperma*, Gærtn.; Fl. Br. Ind. ii. 45; Indis For. Flora 129; Gamble Man. Ind. Timb. 114. The Horse-radish tree. Vern. *Sanjñá*, *Sainjñá*, *Sohjñá*, *Sondná*, Hind.

A fairly large tree with thick corky bark; roots pungent. *Leaves* 1-2·5 ft. long, usually 3-pinnate; petiole sheathing at the base; pinnae opposite, 4-6 pairs; pinnulae opposite, 6-9 pairs, the uppermost pair 1-foliolulate; a hairy gland between each pair of pinnae and pinnulae. *Ultimate leaflets* opposite, 4-8 in. long, obovate or elliptic, entire, membranous, pale beneath. *Flowers* 1 in. diam., strongly

ney-scented. *Sepals* linear-lanceolate, reflexed. *Petals* 7-9 in. long linear-spathulate, white, with yellow dots near the base. *Filament*, villous at the base. *Ovary* hairy. *Capsule* 9-20 by 6-8 in., 3-gonous, linear, pendulous, longitudinally ribbed, slightly constricted between the seeds. *Seeds* 3-cornered, winged at the angles, about 1 in. long including the wings.

Common in the DÚN along the banks of the Jumná, Sông and Suswá rivers; also found in the SAHÁRANPUR SIWALIKS along the ráus and in the Tons valley in JAUNSAH and TEHRI-GARHWAL. Cultivated at DEHRA for the fruit.

The wood is absolutely useless, rotting away in a few months. The leaves, flowers, and fruits are eaten as vegetables. The tender fruit is sometimes pickled. Most wild trees, however, produce bitter flowers and fruits which are therefore not edible. The leaves are also lopped for fodder, especially for camels. A gum, obtained by making incisions in the bark, as well as the pungent roots, are used in medicine. The tree is very easily propagated by cuttings.

Fl. Feb., Apr. Fr. May, June.

CALYCIFLORÆ.

ORDER 33. LEGUMINOSÆ; G. P. N

TREES, shrubs or herbs. *Leaves* alternat compound, stipulate. *Inflorescence* an axil-
nal simple raceme or panicle. *Flowers* 2-se
or irregular, bracteate. *Sepals* 5, connate or
former case often 2-lipped. *Petals* fre
equal or unequal. *Stamens* normally
fewer by suppression or indefinite; fila
variously combined; anthers usually deh
dinally. *Ovary* free, often stipitate; c
ovules one or more on the ventral suture
style simple. *Fruit* a pod (legume),
along one or both sutures. *Seeds* flat



33. LEGUMINOSÆ-PAPILIONACEÆ.

CSL

compressed, with a horny or coriaceous testa, very rare, albuminous.

This large and most important Order is divided into three Sub-Orders:—

Analysis of the SUB-ORDERS.

Petals irregular, free, imbricate; stamens up to 10.

Stamens diadelphous, less frequently monadelphous, rarely free; calyx gamosepalous. . .

I. PAPILIONACEÆ.

Stamens free; calyx divided to or nearly to the base. . .

II. CÆSALPINIÆ.

Petals regular, more or less connate, valvate; stamens usually indefinite. . .

III. MIMOSÆ.

SUB-ORDER I. PAPILIONACEÆ.

Mostly herbs, less frequently shrubs or trees. *Leaves* pinnate or digitate; leaflets often stipellate. *Flowers* 2-sexual, irregular. *Calyx* gamosepalous, 2-lipped. *Corolla* of 5 imbricate petals which are more or less clawed, the 2 innermost similar, free or connate into a sheath next to the ovary, and are called the *keel*, the next two are immediately outside the keel, larger, and are called the *wings*; and the fifth is the outer or odd petal, called the *standard* which is generally erect and reflexed. This type of corolla is papilionaceous, whence the name of the Sub-order. *Stamens* generally 10, diadelphous, sometimes rarely free, inserted with the petals on the corolla tube; anthers often versatile. *Pod* dry, indehiscent. *Seeds* exalbuminous.

Analysis of the Genera.

Leaves 1-2 ft. long 3-foliate; pod compressed;

1. PIPTANTHUS.

Leaves pinnate opposite, ...

2. CROTALARIA.

Leaves 1-2 ft. long 3-foliate; pod turgid.

18. FLEMINGIA.

Piptanthus.] 33. LEGUMINOSÆ-PAPILIONACEÆ.

- Leaves imparipinnate.
 Stamens free; (pod moniliform, indehiscent) . 20. SOPHORA.
 Stamens equally or ^{unequally} diadelphous.
 Leaflets alternate, pod indehiscent . . 19. DALBERGIA.
 Leaflets opposite; pod dehiscing sooner or later.
 Pod cylindrical; stamens apiculate . 3. INDIGOFERA.
 Pod compressed; stamens obtuse.
 Pod few-seeded, tardily dehiscent . 4. MILLETTIA.
 Pod many-seeded, soon dehiscent . 5. TEPHROSIA.
 Leaves paripinnate; stamens diadelphous.
 Unarmed. Pod septate; calyx not oblique.
 Pod long, many-seeded. Erect plants . 6. SESBANIA.
 Pod short, few-seeded. Climbing shrubs . 11. ABRUS.
 Armed. Pod not septate; calyx very oblique . 7. CARAGANA.
 Leaves pinnately 3-foliolate.
 Stamens diadelphous.
 Pod indehiscent, (1-seeded) . . . 8. LESPEDeza.
 Pod dehiscent.
 Pod distinctly jointed.
 Trees. Racemes fascicled, on old wood . 9. OUIGINIA.
 Shrubs. Racemes simple or paniced,
 on current year's shoots; (leaves
 often 1-foliolate). . . 10. DESMODIUM.
 Pod not jointed.
 Nodes of racemes tumid; leaves not
 gland-dotted.
 Petals very unequal; pod few-seeded.
 Keel exceeding the wings and stand-
 ard. Climbing shrubs . 12. MUCUNA.
 Standard exceeding the keel and
 wings. Trees. . . 13. ERYTHRINA.
 Petals equal; pod 1-seeded.
 Flowers small, paniced. . . 14. SPATHOLOBUS.
 Flowers large, racemed. . . 15. BUTEA.
 Nodes of racemes not tumid; leaves
 gland-dotted. . . 17. RHYNCHOSIA.
 Stamens monadelphous (pod dehiscent, not
 jointed, few-seeded.) . . . 16. PUEBARIA.

1. *Piptanthus*, D. Don; G. P. n. 2.

1. *P. nepalensis*, D. Don; Fl. Br. Ind. ii. 62; Brandis
 For. Flora 132; Gamble Man. Ind. Timb. 116. Vern. *Chamba*,
Chamboá, Jaunsar.

A shrub 8 to 12 ft. high, with green bark. *Leaves* digitately
 3-foliolate; common petiole 7-1.5 in.; stipules connate, opposite to



33. LEGUMINOSÆ-PAPILIONACEÆ. [*Piptanthus*.

the petiole, 2·3 in. long, broadly triangular, drying brownish-grey, pubescent, deciduous. *Leaflets* sessile, 2-4 by 5·1 in., lanceolate or narrow-elliptic, acuminate, entire, dark-green above, pale beneath, grey-pubescent when young, afterwards glabrous and shining; midrib prominent beneath; main lateral nerves about 12 pairs, faint. *Flowers* yellow, about 1·25 in. long, in short compact hairy racemes 4-5 in. long; pedicels 5·7 in. long; bracts tomentose. *Calyx* about 5 in. long, campanulate, densely white-pubescent, deciduous from the base. *Petals* bright-yellow, all clawed, 1 in. long including the claw which is about 5 in. long. *Stamens* 10, free, equal; anthers uniform. *Ovary* linear, stipitate, hairy. *Pod* 3-5 by 4·5 in., flat, narrowed at both ends, on a stipe 8-1 in. long; seeds 3-10.

JAUNSA, 7,900 ft. Deoban near "Chakrata View" and below "Snow View"; on the slopes of the Karámbá peak and elsewhere about Mundáli.

Planted for ornament in the hills on account of its handsome yellow flower.

Fl. Apr.-June. Fr. Aug., Sept.

2. *Crotalaria*, Linn.; G. P. n. 53.

The Kidney Beans.

Herbs or shrubs. *Leaves* simple or 3-foliolate, rarely imparipinnate. *Flowers* yellow blue or purplish, in terminal or leaf-opposed lax racemes. *Calyx-tube* short; teeth almost equal, or connate and 2-lipped. *Corolla* generally showy; standard shortly clawed, round; wings and keel of the same length; the latter broader, beaked. *Stamens* monadelphous, forming an open sheath; anthers alternately versatile and basifixed. *Ovary* linear; style incurved at the base, bearded. *Pod* inflated, turgid.

This large Genus is noted for strong fibre.

Analysis of the Species.

- | | |
|--|--------------------------|
| Corolla much exserted; pod glabrous | 1. <i>C. sericea</i> . |
| Corolla little exserted; pod densely velvety | 2. <i>C. tetragona</i> . |

1. *C. sericea*, Retz; Fl. Br. Ind. ii. 75. Vern. *Ohhunnuna* Hind.; *Sanni*, E. Dún.



Indigofera.] 33. LEGUMINOSÆ-PAPILIONACEÆ.

An undershrub 4-6 ft. high, with stout but fleshy striated branches. *Leaves* simple, 3-6 by 2-3·5 in., oblanceolate-oblong, tapering into a short petiole, subcoriaceous but soft, glabrous above, finely silky beneath; stipules leafy, persistent. *Racemes* terminal, about a foot long. *Calyx* 5 in.; teeth lanceolate. *Corolla* 7-8 in. long, golden-yellow. *Pod* 1-2 by 7-8 in., smooth; seeds kidney-shaped, many, imbricating in two rows, on long funicles.

Common in fallow lands and forest-glades in the DÚN and in the SAHÁRANPUR SIWALIKS. Doiwála, Phándowála, Karwápáni, Bholkhand, etc.

The stem yields a fairly strong fibre.

Fl. & Fr. Nov.-Mar.

2. *C. tetragona*, Roxb.; Fl. Br. Ind. ii. 78.

A stiff shrub, 4-6 ft. high; branches quadrangular, silky. *Leaves* 6-12 by 5-1·5 in., linear or lanceolate, acuminate, membranous, thinly silky or glabrescent; stipules usually 0. *Racemes* 6-8 in. long, few-flowered. *Flowers* 1-1·5 in. long. *Calyx* 7-1 in. long, brown-velvety. *Corolla* yellow, very slightly exserted. *Pod* 1·5-2 in. long, densely dark-brown-velvety, 12-20-seeded.

Ráu-beds in the SAHÁRANPUR SIWALIKS. Timli Pass.

Fl. Sept.-Nov. Fr. Mar.-June.

The cultivated *Sann* or *Sun*, *C. juncea*, Linn.; Fl. Br. Ind. ii. 79, closely resembles the last species, but has smaller leaves, and pod clothed with persistent silky hairs. It yields the *sun* fibre. Many other species occur in the SCHOOL CIRCLE, but they are mostly herbaceous or inconspicuous.

3. *Indigofera*, Linn.; G. P. n. 91.

Herbs or shrubs clothed with adpressed white hairs. *Leaves* usually imparipinnate; leaflets entire. *Inflorescence* a copious axillary raceme. *Calyx* small, campanulate, 5-toothed. *Standard* ovate; *keel* at first held in a bent position by spurs on either side which catch on the wings, but straightens afterwards with a sudden jerk—a contrivance in nature for the dissemination of pollen. *Stamens* diadelphous; anthers apiculate. *Ovary* sessile, many-ovuled; style glabrous; stigma capitate. *Pod* usually linear-cylindrical and straight.

*Analysis of the Species.*

- Branchlets white-canescant; bracts minute; (leaves subcoriaceous) . 1. *I. heterantha*.
Branchlets glabrescent; bracts exceeding the buds.
Leaves membranous.
Stipellæ minute; cor. dark-purple. 2. *I. atropurpurea*.
Stipellæ distinct; cor. crimson-red. 3. *I. hebetata*.
Leaves subcoriaceous; (corolla rose-coloured.) 4. *I. pulchella*.

1. ***I. heterantha***, Wall.; Brandis For. Flora 135; Gamble Man. Ind. Timb. 117. *I. Gerardiana*, Wall., var. *heterantha*; Fl. Br. Ind. ii. 100. Vern. *Káthi*, *Káthoi*, Jaunsar; *Sákiná*, Garhwal.

A shrub with brown bark; branchlets white-canescant. *Leaves* 1·5-2·5 in. long, short-petioled. *Leaflets* 17-31, opposite, 3·5 in. long, obovate, mucronate, subcoriaceous, pale-grey beneath, clothed with short white hairs above; stipellæ and bracts minute. *Racemes* 1-2·5 in. long, peduncled. *Flowers* about 5 in. long. *Calyx* campanulate, hairy outside. *Corolla* 2·4 in. long, red. *Pod* 1-1·5 in. long, spreading, cylindrical, glabrous.

JAUNSAR and TEHRI-GARHWAL, 3,000-8,500 ft., from Saia all the way to Deotá, Lambátách, etc.

The twigs are used for basket-work. The shrub is gregarious and has some value as fuel near hill-stations like Chakrata.

Fl. May, June. Fr. Sept.-Nov.

I. Gerardiana, Wall., or the type of this species according to the Fl. Br. Ind., is a smaller plant with fewer leaflets, but larger pod. It is less common; Deotá, Koti-Kanásar, etc.

2. ***I. atropurpurea***, Hamilt.; Fl. Br. Ind. ii. 101; Brandis For. Flora 136; Gamble Man. Ind. Timb. 117. Vern. *Káthi*, *Káthoi*, *Dande-ká Kátha*, Jaunsar; *Kálá Sákiná*, Garhwal.

A tall shrub; branchlets glabrescent. *Leaves* imparipinnate, 4-8 in. long; petiole 1-3 in. long. *Leaflets* 5-13, opposite, 8-2 by 6-1 in., ovate obovate or elliptic, membranous, glabrescent, dark-green; stipellæ minute. *Racemes* 4-6 in. long; peduncle 1-2 in.; bracts lanceolate, exceeding the buds. *Flowers* 3-4 in. long. *Calyx* about 1 in. long, obliquely campanulate, with scattered white hairs outside. *Corolla* deep-pink or dark-purple. *Pod* linear, turgid, glabrous, not narrowed into a beak.

JAUNSAR and TEHRI-GARHWAL up to 8,500 ft.: Deoban, Mundáli, Kathián, etc.



33. LEGUMINOSÆ-PAPILIONACEÆ.

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Economic use as of the foregoing species.

Fl. Mar.-June, according to elevation.

3. *I. hebeptala*, Benth.; Fl. Br. Ind. ii. 101.

A tall shrub; branchlets glabrescent. *Leaves* imparipinnate, 4-6 in. long. *Leaflets* 13-17, opposite, usually 1-1.5 in. long, ovate, obtuse, membranous, dull-green above, pale beneath; stipellæ distinct. *Racemes* 2-4 in. long, few-flowered, peduncled; bracts boat-shaped, bristly at the tip, exceeding the buds. *Calyx* 1 in. long, obliquely campanulate. *Corolla* 5 in. long, deep-red. *Pod* glabrous, 1.5-2 in. long, 8-10-seeded.

JAUNSAR, 7, 10,000 ft., generally in shady places: Jhálkúri Konáin, etc.

The stems and branches are used for fuel.

Fl. May, June.

4. *I. pulchella*, Roxb.; Fl. Br. Ind. ii. 101; Brandis For. Flora 136. Vern. *Níl*, Hind.; *Sákiná*, Dún and Garhwal.

A shrub 10-12 ft. high; branchlets glabrescent. *Leaves* imparipinnate, 3-6 in. long. *Leaflets* 13-21, opposite, 6-8 by 3-4 in., obovate-oblong, subcoriaceous, pale-green above, glaucous beneath, with adpressed grey hairs on both surfaces; stipellæ minute or 0. *Racemes* 1-4 in. long, moderately compact, short-peduncled; bracts boat-shaped, exceeding the buds. *Calyx* about 1 in. long, white-canescient; teeth short. *Corolla* about 8 in. long, bright-red or rose-coloured; standard reflexed. *Pod* 1.2-1.7 in. long, straight, turgid, glabrous, 8-12-seeded; sutures broad.

Sál forests of the DÚN and the SIWALIKS, and the HILLS up to 9,000 ft., very common in some localities, e.g., Karwápáni, Konáin, Mundáli, etc.

The branches are often used for fences, and also for fuel.

Fl. Nov.-Mar. Fr. Rainy season.

I. hirsuta, Linn.; Fl. Br. Ind. ii. 98;—is a short suberect herbaceous plant with stems densely clothed with brown pubescence. *Racemes* 2-4 in. long, very dense. *Flowers* red. *Pod* 7-1 in. long, densely pubescent. Found in grass-lands and ráu-beds in the SIWALIK TRACTS. Phándowála, Ránipur, etc.

I. Dosua, Ham.; Fl. Br. Ind. ii. 102;—is a low shrub densely pubescent like the above. *Flowers* bright-red, *Pod* about 1 in. long, glabrescent. Common in grass-lands and fire-traces in the HILLS: Lokhár, Ringáli, Bháshlá, etc.



33. LEGUMINOSÆ-PAPILIONACEÆ.

[*Millettia*.]

4. *Millettia*, W. & A.; G. P. n. 104.

1. *M. auriculata*, Baker; Fl. Br. Ind. ii. 108; Brandis For. Flora 138; Gamble Man. Ind. Timb. 118. Vern. *Gauj*, Hind.

A large woody gregarious climber. *Leaves* 1-2 ft. long, crowded at the ends of the branches; petiole with a swollen base. *Leaflets* 7-9, lateral opposite, 3-8 by 2-5 in., obovate, elliptic or oblong, abruptly acuminate, entire, subcoriaceous, densely grey-silky when young, afterwards glabrescent above, pale beneath; stipellæ minute. *Racemes* 4-10 in. long, axillary; rachis downy. *Flowers* 3-4 in. long, dull-white, fasciated on the rachis. *Calyx* about 1 in. long, shortly toothed, densely silky. *Corolla* 3-4 in. long, silky all over; standard auriculate above the claw, (whence the specific name); wings falcate; keel-petals incurved. *Stamens* monadelphous (though generally diadelphous in the Genus). *Style* filiform, incurved, glabrous; stigma capitate. *Pod* 4-7 by 1-1.5 in., hard, brown-velvety, with very thick sutures.

Extremely common and a pest in the DÚN and SANÁRANPUR FORESTS; also found in the Tons valley and elsewhere in JAUNSAIR and TEHRI-GARHWAL, up to 3,000 ft.

The branches when beaten give a coarse fibre which is used for rough cordage. They are also made into brushes for daubing trees with paint. The leaves and twigs are lopped for cattle-fodder and eaten by elephants.

Fl. May, June. Fr. Cold season.

5. *Tephrosia*, Pers.; G. P. n. 100.

1. *T. candida*, DC.; Fl. Br. Ind. ii. 111; Brandis For. Flora 138; Gamble Man. Ind. Timb. 118. Vern. *Loshtiá*, Dún.

A low shrub; branches grooved, clothed with brown or grey velvety pubescence. *Leaves* imparipinnate, 5-9 in. long, short-petioled; stipules setaceous. *Leaflets* 19-25, opposite, 2-3 by 3-7 in., narrow-elliptic, acute at both ends, entire, coriaceous, dark-green and glabrous above, pale and silky beneath; lateral nerves numerous, straight, very fine; midrib prominent. *Racemes* 6-9 in. long, terminal and lateral, often fasciated; pedicels 3-5 in. long, silky. *Calyx* campanulate, 15-2 in. long, short-toothed, silky. *Corolla* 7-1 in. long, white with a shade of red; petals clawed; standard suborbicular, densely silky. *Stamens* diadelphous. *Pod* 8-4 by 3 in., 10-12-seeded, continuous, slightly recurved, clothed with adpressed brown silky hairs, generally tipped with the persistent style.

Common in some parts of the DÚN, e.g., Chandrabani, Rámgarh, Bindál-nálá, Bidhalna Block, etc.

The leaves and bark are used to intoxicate fish.

Fl. Aug., Sept. Fr. Nov., Dec.



Caragana.]

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6. Sesbania, Pers. ; G. P. n. 118.

1. **S. ægyptiaca**, Pers. ; Fl. Br. Ind. ii. 114 ; Brandis For. Flora 137 ; Gamble Man. Ind. Timb. 118. Vern. *Jaent*, Hind.

A soft-wooded shrub 10-15 ft. high, of brief duration. *Leaves* paripinnate, 3-6 in. long. *Leaflets* 9-20 pairs, .6-1 by .1-2 in., linear-oblong, minutely petioluled, membranous, glabrous, pale-green. *Racemes* 3-6 in. long, axillary, few-flowered ; pedicels about .2 in. long. *Flowers* pale-yellow. *Calyx* campanulate, .2 in. long, short-toothed, membranous, glabrous. *Petals* .5-.7 in. long, yellow, often with purple spots. *Stamens* diadelphous. *Pod* 6-9 by .15 in., torulose, flexible, twisted, 20-30-seeded, septate between the seeds.

Cultivated throughout the plains of India for its wonderfully quick growth and shade-yielding capacity ; doubtfully wild in the DUN.

Wood white, extremely soft, weighing about 27 lbs. per c. ft. It is said to give the best gunpowder charcoal. The fibre of the bark is used for rope, and the leaves and tender branches for cattle-fodder.

Fl. Aug., Sept. Fr. Dec.-Feb.

7. Caragana, Lam. ; G. P. n. 130.

1. **C. brevispina**, Royle ; Fl. Br. Ind. ii. 116 ; Brandis For. Flora 133. Vern. *Äri*, *Kathür-kantä*, Jaunsar.

An erect spinescent shrub, 6-8 ft. high ; young branches finely downy. *Leaves* paripinnate, 2-4 in. long ; rachis finally spinescent. *Leaflets* 8-16, variable, .3-.6 by .2-.5 in., obovate, pubescent beneath, minutely petioluled. *Racemes* 2-3 in. long, umbellately 1-3-flowered, pedicels downy, bracteate. *Calyx* campanulate, placed very obliquely on the pedicel, .3-.4 in. long, pubescent ; teeth acute. *Petals* yellow, .6-1 in. long, all of nearly the same length ; standard broad, reflexed, much thicker and firmer than the other petals. *Stamens* diadelphous. *Style* incurved, glabrous. *Pod* 2-3 in. long, straight, cylindrical, turgid, glabrous outside, woolly inside.

JAUNSAR and TEHRI-GARHWAL 6,900 ft. Common at Konáin, Mundáli and Deotá.

Fl. Apr.-June. Fr. Aug.-Oct.

C. Gerardiana, Royle ; Fl. Br. Ind. ii. 116 ;—has also been found in TEHRI-GARHWAL, e. g. the Jaurási and Morirú Blocks. It is a diffuse undershrub differing from the above in having smaller leaves and leaflets, subsessile flowers, and shorter pods which are hirsute outside.

Fl. May-Aug.

8. *Lespedeza*, Mich.; G. P. n. 182.

Herbs or undershrubs. *Leaves* pinnately 3-foliolate, without stipellæ. *Flowers* axillary, fascicled or racemed. *Calyx-tube* campanulate; teeth long. *Corolla* exserted; standard broad. *Stamens* diadelphous. *Ovary* sessile or stipitate, 1-ovuled; style long, incurved, often persistent; stigma minute. *Pod* 1-seeded, small, oblong, compressed, reticulate, indehiscent.

Analysis of the Species.

- Keel obtuse, not much incurved; flowers fascicled in leaf-axils. 1. *L. sericea*.
 Keel acute, much incurved; flowers racemed.
 Pod about 1 in. long, densely grey-silky 2. *L. stenocarpa*.
 Pod 2 in. long, clothed with adpressed hairs. 3. *L. eriocarpa*.
 1. ***L. sericea***, Miq.; Fl. Br. Ind. ii. 142. Vern. *Khúnjú*.

Dún.

An erect undershrub, 2-4 ft. high, with long slender branches. *Leaves* ascending; petiole short. *Leaflets* 3-6 by about 1 in., linear-cuneate, emarginate, minutely petioluled, rigidly coriaceous, usually glabrous above, adpressedly silky-hairy beneath. *Flowers* 2-4 together in the axils of the leaves; pedicels short; bracteoles minute. *Calyx* 1 in. long, canescent, teeth very long. *Corolla* about 2 in. long, white but tipped with purple. *Pod* 1 in. long, thinly silky; style 2 in. long, persistent.

JAUNSAE and the DÚN. Lachiwála, Rámgarh, Chakrata.

Fl. May, June. Fr. Oct., Nov.

2. ***L. stenocarpa***, Maxim.; Major Prain's Additional Leguminosæ in Journ. As. Soc. Beng. lxvi, Part II, No. 2, 376. Syn.—*L. macrostyla*, Baker (in part); Fl. Br. Ind. ii. 143.

An undershrub, 3-5 ft. high; branches densely white-pubescent. *Petiole* 5-7 in. long. *Leaflets* 5-8 by 4-6 in., obovate-cuneate, often emarginate, rigidly subcoriaceous, white-silky beneath. *Racemes* short, dense, silky; buds hidden by ovate silky bracts; pedicels 1-2 in. long. *Calyx* 1 in.; teeth longer than the tube. *Corolla* 4-6 in. long, red. *Pod* about 1 in. long, shortly stalked, narrow-oblong, densely grey-silky, gradually tapering to the base of the persistent hairy style.

Common in the SIWALIK tract, on steep sandy hill-slopes and banks of ráus. Mohand Pass, Dholkhand, Ránipur, etc. Also low elevations in the HILLS.

Fl. Aug., Sept. Fr. Dec.-Feb.

3. **L. eriocarpa**, DC.; Fl. Br. Ind. ii. 144.

A much-branched erect shrub, 3-4 ft. high; branchlet slender, angular, furrowed, silky. *Petiole* (except in var. *Falconeri*, Prain) longer than in the other two species, sometimes up to 1.5 in.; stipules setaceous, 2-3 in. long. *Leaflets* 3-1 in. long, obovate-cuneate, adpressedly silky-hairy beneath. *Racemes* 2-3 in. long, rather lax, peduncled; bracts not exceeding the buds; pedicels 1.5-2 in. *Calyx* 1.5 in. long; teeth much longer than the tube. *Corolla* 4.5 in. long, bright-pink. *Pod* 2-3 in. long, coriaceous; style as long as the pod, pubescent near the base.

Fairly common in JAUNSAAR and TEHRI-GARHWAL, 4,800 ft. Lurli, Missau, Kathian, Tons valley, etc.

Fl. May-Sept. Fr. Cold season.

9. **Ougeinia**, Benth.; G. P. n. 169.

1. **O. dalbergioides**, Benth.; Fl. Br. Ind. ii. 161. Brandis For. Flora 146; Gamble Man. Ind. Timb. 119. Vern. *Sandan*, Hind.

A middle-sized tree with a thin ashy-grey or light-brown bark which exudes beads of red gum when cut. *Leaves* pinnately 3-foliolate, stipellate; rachis 3-6 in. long, channelled above. *Lateral leaflets* opposite, 2.5-4.5 by 1.5-3 in., obliquely elliptical; *terminal* 3-6 by 2-3.5 in., broad-ovate; all entire or obscurely crenate, coriaceous, glabrous above, more or less downy or glabrescent beneath; lateral nerves about 6 pairs; petiolules 1-2 in. long. *Flowers* light-pink or white, in fascicled racemes generally from the old wood; pedicels 5-8 in. long, very slender, clustered from short branches of the raceme; bracts small, scaly. *Calyx* 1-1.5 in. long, pubescent; teeth obtuse. *Corolla* 3-4 in. long; standard nearly orbicular, shortly clawed; keel obtuse. *Pod* very distinctly jointed, 2-4 by 3 in., flat; joints 6-8 in. long. *Seeds* about 2 in. long, smooth, brown when mature.

A common tree in Sál forests in the DÚN and SAHÁRANPUR-SIWALIKS and in the OUTER HIMALAYA; also found in the chir forests in JAUNSAAR and TEHRI-GARHWAL, up to 4,000 ft., e.g., Khúnigádh, Moltá, etc.

Heartwood pale or deep reddish-brown, hard, close-grained, strong, tough and durable, and takes a beautiful polish; weight 55-65 lbs. per c. ft. It is much used for agricultural implements, furniture, building, and the like. The bark yields an astringent red gum, and is pounded and used to intoxicate fish. The twigs are lopped for cattle-fodder. The tree can be most easily propagated by root-suckers.

Leafless Feb., Mar. Fl. Mar., Apr. Fr. May, June.



10. *Desmodium*, Desv.; G. P. n. 170.

Shrubs or herbs. *Leaves* pinnately 3-foliolate or simple, stipellate. *Flowers* small, red or whitish, in axillary and terminal simple or panicled racemes, rarely umbelled. *Calyx* campanulate or turbinate. *Corolla* exserted; standard broad; wings more or less attached to the keel, which is usually obtuse. *Stamens* diadelphous, sometimes the upper stamen only partially free. *Style* incurved; stigma minute, capitate. *Pod* compressed, usually articulate; joints 1-seeded, generally indehiscent, rarely splitting open in a continuous line along the ventral suture.

Analysis of the Species.

Flowers umbelled; leaves 3-foliolate.

Umbels axillary, naked 1. *D. Cephalotes*.

Umbels arranged in plicate racemes, hidden by a pair of persistent foliaceous bracts 2. *D. pulchellum*.

Flowers in axillary and terminal, simple or panicled racemes.

Pod distinctly jointed; joints generally indehiscent.

Leaves 1-foliolate.

Petiole winged. 4. *D. triquetrum*.

Petiole not winged. 6. *D. latifolium*.

Leaves 3-foliolate.

Leaflets dark-green, narrow; pod beset with hooked hairs 3. *D. laburnifolium*.

Leaflets pale-green, broad; pod thinly silky-hairy 5. *D. tiliæfolium*.

Pod indistinctly jointed, dehiscing in a continuous line along the ventral suture; (leaves normally 3-foliolate). 7. *D. gyrans*.

1. *D. Cephalotes*, Wall.; Fl. Br. Ind. ii. 161; Gamble Man. Ind. Timb. 121. Vern. *Bhattā*, Garhwal.

A shrub 4-6 ft. high, with grey bark; branches triquetrous. *Leaves* 3-foliolate; petiole 1-2 in. long, deeply furrowed, grey-downy. *Leaflets* 3.5-6 by 1.5-2.5 in., oblong or elliptic, subcoriaceous, grey-silky beneath; lateral nerves and midrib prominent and brightly silky beneath the former 10-16 pairs. *Flowers* about 3 in. long, 20 or



more in dense axillary umbels; pedicels silvery, jointed at the apex. *Calyx* 15 in. long; teeth lanceolate. *Corolla* red, 25 in. long. *Pod* about 1 in. long, 4-5-jointed, indented more or less along both sutures, densely grey-silky.

Common in the Sál forests of the Dún, especially at Lachiwála and Tháno.

The pods are said to be poisonous for cattle.

Fl. July, Aug. Fr. Nov., Dec.

2. **D. pulchellum**, Benth.; Fl. Br. Ind. ii. 162; Brandis For. Flora 145. Vern. *Thápi*, Garhwal; *Jalá Sálpán*, Hind.?

An erect shrub, 4-6 ft. high; branches ribbed, grey-downy. *Leaves* 3-foliolate; petiole 3-5 in. long. *Lateral leaflets*, 1.5-2.5 by .6-1 in., .5-.8 in. below the *terminal* which is 2.5-4 by 1.2-1.5 in., both elliptic or oblong-lanceolate, generally acute, rounded at the base, pubescent beneath; lateral nerves 8 pairs. *Flowers* 2-3 in. long, in 2-6-flowered umbels, each umbel subtended by a pair of persistent orbicular foliaceous bracts about .5 in. diam., the umbels themselves in axillary and terminal plicate racemes, 4-10 in. long. *Calyx* 1 in. long; teeth shorter than the tube. *Corolla* 25 in., white with a shade of red. *Pod* 25 in. long, generally with 2 joints, constricted at both sutures.

Common in the Dún in the same localities as the preceding species.

Fl. July-Sept. Fr. Cold season.

3. **D. laburnifolium**, DC.; Fl. Br. Ind. ii. 163.

A shrub 6-8 ft. high; branches few, slender, glabrescent; bark dark-grey. *Leaves* 3-foliolate; petiole 1-1.5 in., thickened, grooved; stipules free, minute. *Leaflets* 2-4 by 1-1.5 in., oblong-lanceolate, acute at both ends, dark-green, glabrous and shining above, hairy on the nerves beneath. *Racemes* about 6 in. long; pedicels 2-3 in. *Flowers* whitish, 3-4 in. long. *Calyx* about a third of the flower, hairy; teeth narrow, as long as the tube. *Carolla* 2-3 in. *Pod* 2-4 in. by .3 in., beset with short hooked hairs; joints 6-8, rectangular, twice as long as broad, easily breaking off.

In damp shady localities in the Dún, such as Mothronwála, Nakraunda, Jogiwála, Khairi, Bobbers' Cave, etc.

The leaves are eaten by buffaloes.

Fl. July, Aug. Fr. Dec., Jan.

4. **D. triquetrum**, DC.; Fl. Br. Ind. ii. 163; Brandis For. Flora 146.



33. LEGUMINOSÆ-PAPILIONACEÆ. [*Desmodium*.]

A sub-procumbent shrub, 4-6 ft. long; branches triquetrous, glabrescent. *Leaves* 1-foliolate. *Leaflet* 3-6 by 1·2-2·2 in., oblong-lanceolate, acute, subcoriaceous, scaberulous above, hairy on the nerves beneath; petiole 7-1·3 in. long, winged to an oblanceolate shape, 2·4 in. broad; main lateral nerves 12-15 pairs. *Racemes* 6-12 in. long, axillary and terminal; pedicels 1·2 in. *Calyx* about 1 in., campanulate. *Pod* 1-2 by 2 in., 6-8-jointed, glabrous or pubescent, indented between the joints at the ventral suture.

Common about Lachiwála on forest-paths, in grass-lands, and along the banks of the Ré-nadi in the Dún.

Fl. July, Aug. Fr. Sept.-Dec.

5. ***D. tiliaefolium***, G. Don; Fl. Br. Ind. ii. 168; Brandis For. Flora 145; Gamble Man. Ind. Timb. 120. Vern. *Mártoi*, *Mátoi*, Jaunsar.

A somewhat diffuse shrub, 4-10 ft. high; branchlets pubescent. *Leaves* 3-foliolate; rachis 1·5-3·5 in. long, pubescent. *Leaflets* 1-3 by 7-2·2 in., broad-ovate or rhomboid, often mucronate at the apex, subcoriaceous, glabrescent above, silky-pubescent beneath, margins entire or wavy; main lateral nerves about 6 pairs, the lowest pair from near the base. *Flowers* red, in terminal panicles and axillary racemes; pedicels 3-4 in. long, filiform, finely downy. *Calyx* 1 in., downy; teeth shorter than the tube. *Corolla* 3-5 in. long. *Pod* 2-3 by 25 in., slightly falcate, compressed, indented between the joints at the inner edge, thinly silky-hairy; joints 6-9, longer than broad.

Common and somewhat gregarious in JAUNSAK and TEHRIGARHWAL, between 4,000 and 8,500 ft.

The thin grey bark is used for rope and paper-making. The twigs are browsed by cattle, and the branches are cut up into faggots and used for fuel in Chakrata.

Fl. June, July. Fr. Oct., Nov.

6. ***D. latifolium***, DC.; Fl. Br. Ind. ii. 168; Brandis For. Flora 145.

An erect undershrub, 4-6 ft. high. *Leaves* 1-foliolate. *Leaflet* 2-5 by 1·5-3·5 in., broad-ovate, truncate or cordate and 3-nerved at the base, hispid above, densely soft-pubescent beneath; tip rounded or acute, mucronate; lateral nerves 7-8 pairs including the basal; petiole 4-7 in. long; stipules semicordate, cuspidate. *Flowers* 2 in. long, bright-purple, clustered on axillary and terminal racemes which are 4-8 in. long. *Calyx* minute; teeth linear. *Pod* 6-1 by about 1 in., 4-6-jointed, much constricted between the joints, densely clothed with minute hooked hairs; joints 4-6, rather longer than broad, readily separating.



The DŪN and the OUTER HIMALAYA, up to 3,500 ft.

Fl. Aug., Sept. Fr. Nov., Dec.

7. **D. gyrans**, DC.; Fl. Br. Ind. ii. 174; Brandis For. Flora 146; Gamble Man. Ind. Timb. 120. The Telegraph plant. Vern. *Khr̥ni*, Garhwal.

An erect shrub, 4-8 ft. high, with glabrous green branches. *Leaves* normally 3-foliolate, but often 1-foliolate by the abortion or early fall of the small lateral leaflets; petiole 1-1.5 in. *Terminal leaflet* 3-4 by 1-1.7 in., oblong-lanceolate, quite entire, rather membranous, glaucous beneath, often with irregular-shaped glaucous blotches above; main lateral nerves about 10 pairs. *Lateral leaflets* absent or rudimentary, .5-.7 by .1-.12 in., rotating by jerks. *Flowers* .5 in. long, in axillary racemes and terminal panicles, at first hidden by large ovate bracts; pedicels .25 in. long, downy. *Calyx* .1 in. long, campanulate; teeth short. *Corolla* .2-.3 in. long. *Pod* 1-1.5 by .2 in., falcate, 6-10-jointed, slightly indented along the lower, and dehiscing in a continuous line along the upper, suture.

Common in the DŪN and in Chir forests along the TONS valley, usually among grass.

Fl. Aug., Sept. Fr. Nov.-Jan.

Two forms of this plant are noticeable;—one scarcely exceeding 4 ft. in height, with narrow-lanceolate, somewhat coriaceous terminal leaflet, petiole less than 1 in. long, and scaberulous pods,—and the other about twice as tall, with wider oblong-elliptic rather membranous terminal leaflet, much longer petiole, and glabrous or glabrescent pods. Is the latter var. *Roylei*, W. & A.?

This large Genus comprises several other shrubs and undershrubs occurring in the SCHOOL CIRCLE, of which the following deserve brief notice:—

1. *D. laxiflorum*, DC.; Fl. Br. Ind. ii. 164. weak suberect plant with 3-foliolate leaves. *Leaflets* 3-6 in. long, elliptic, membranous. *Racemes* 8-15 in. long, slender, drooping. *Pod* 1.5-2 by .08 in., somewhat constricted and easily breaking off between the joints, catching on clothes by hooked hairs. Common in the DŪN.

Fl. Aug., Sept. Fr. Nov., Dec.

2. *D. sambuense*, DC.; Major Prain's Additional Leguminosæ in Journ. As. Soc. Beng., lxi, Part ii., No. 2, 394. Syn.—*D. floribundum*, G. Don.; Fl. Br. Ind. ii. 167. Vern. *Gor Mātoi*, Jaunsar. *Stem* angular. *Leaves* 3-foliolate. *Leaflets* 1.5-2 by 1-1.5 in., rhomboid or elliptic; common petiole 2-3 in.; stipules prominent. *Racemes* 3-6 in. long. *Flowers* .5 in. long. *Pod* .7-1 by .1 in., 6-8-jointed.



33. LEGUMINOSÆ-PAPILIONACEÆ. [*Desmodium*.

JAUNSAK about Chakrata, Dhármigádh, etc.; also Sainjni, Kúlni, etc. in TERBI-GARHWAL.

3. *D. gangeticum*, DC.; Fl. Br. Ind. ii. 168. Stem 2-3 ft. high. Leaves 1-foliolate; petiole '7-12 in. Leaflet 2-4 in. long, variable in width, ovate to narrow-lanceolate, membranous. Racemes 6-12 in. long, mostly terminal; pedicels ascending. Flowers about '2 in. long. Pod '5-7 by '1 in., 6-8-jointed, common in blanks in Sál forests in the DÚN. Fl. July, Aug. Fr. Cold season.

4. *D. concinnum*, DC.; Fl. Br. Ind. ii. 170. A tall undershrub with slender drooping branches. Leaves 3-foliolate; petiole '5-1 in. Leaflets oblong, obtuse, 1-5 in. long, lateral ones smaller. Racemes terminal and lateral, 6-12 in. long; bracts conspicuous. Flowers '2-3 in. long. Pod 1 by '12 in., 4-6-jointed. Robbers' Cave near DEHRA DÚN.

5. *D. parvifolium*, Baker; Fl. Br. Ind. ii. 172. A diffuse undershrub with 1-3-foliolate leaves. Leaflets very variable in size, '2-1.5 in. long, oblong, subcordate, membranous. Flowers '15 in. long; corolla included in the calyx. Pod about '5 in. long, falcate 4-6-jointed. Rámgarh and Karwápáni in the DÚN.

Fl. Aug., Sept. Fr. Nov., Dec.

11. *Abrus*, Linn.; G. P. n. 183.

1. *A. precatorius*, Linn.; Fl. Br. Ind. ii. 175; Brandis For. Flora 139. Vern. Chúnpli, Ratgiri, Dún; Gúnjá, Gúnchá, Hind.

A much-branched climber with a woody stem. Leaves paripinnate, 2-3 in. long. Leaflets 20-40, opposite, deciduous, '4-1 by '2-3. in., oblong-ligulate, membranous, glabrous or thinly silky beneath. Flowers reddish or white, in dense pedunculate racemes which are shorter than, or as long as, leaves; peduncles often leaf-bearing. Calyx '1-1.5 in. long, campanulate, truncate, thinly silky. Corolla '3-5 in. long; standard ovate, acute; wings narrow; keel larger than the wings, arcuate. Stamens 9, united in a sheath which is slit above; the tenth absent. Ovary many-ovuled; style short, incurved, not bearded; stigma capitate. Pod 1-1.7 by '4-5 in., oblong, turgid, 3-5-seeded. Seeds about '2 in. long, ovoid or subglobose, generally two-thirds scarlet or white and the rest black, with a large white hilum in the black part, sometimes wholly black or white, smooth, shining.

Very common along the foot of the SAHÁRANPUR SIWALIKS specially near Khárá, Ránipur and Kasúmri; also on hedges in the DÚN. Ámláwa valley, JAUNSAK.



33. LEGUMINOSÆ-PAPILIONACEÆ.

CSL 121

The seeds are recognized by Indian jewellers as the minimum unit of weight, and are used for weighing gold and precious stones. The root resembles liquorice in medicinal property.

Fl. Aug., Sept. Fr. Cold season.

A. pulchellus, Wall., Fl. Br. Ind. ii. 175,—differs from the above in having larger leaflets, racemes exceeding the leaves, larger but thinner-valved pod and greyish-brown compressed seeds. Found in the DŪN (Lachiwála, Tháno, Ráipur, etc.) and the OUTER HIMALAYA.

Fl. Aug., Sept.

12. *Mucuna*, Adans.; G. P. n. 205.

Climbers, generally herbaceous. *Leaves* large, pinnately 3-foliolate, stipellate. *Flowers* large, usually dark-purple, in few-flowered racemes or corymbes. *Calyx* campanulate, the two upper teeth connate. *Corolla* much exserted; keel rostrate, much exceeding the standard and usually slightly exceeding the wings. *Stamens* 2-adelphous; anthers alternately versatile and basifixed. *Ovary* sessile, many-ovuled; style incurved, beardless; stigma capitate. *Pod* hard, usually covered with irritating bristles.

Analysis of the Species.

Leaves glabrous; pod obliquely plaited on the faces. 1. *M. atropurpurea*.

Leaves silky beneath; pod not plaited on the faces. 2. *M. pruriens*.

1. *M. atropurpurea*, DC.; Fl. Br. Ind. ii. 186. Vern. *Bhainswáli-bel*, DŪn.

A climber with soft porous wood. *Leaflets* 5-8 by 3·5-5 in., ovate or cillipte, 3-5-nerved at the base, membranous, shining above; lateral very oblique, the end one cuspidate; rachis 5-8 in. long; *Racemes* 6-12 in. long, long-peduncled, drooping, 12-30-flowered, often forked; bracts small, deciduous; bracteoles 2·3 in. long. *Calyx* 5·6 in. long, 2-lipped, grey-pubescent and also with scattered irritating brown bristles. *Corolla* 2-2·5 in. long, dark-purple; standard about half the length of the keel; wings about half the length of the standard. *Pod* 3-4 by 1-1·3 in., with close oblique plaits on the faces, covered with brownish-yellow irritating bristles.



33. LEGUMINOSÆ-PAPILIONACEÆ.

[*Mucuna*]

Found in the DÚN about Dehra, and also in the Dhármigádh valley, JAUNSAAR. Not common.

Fl. Aug., Sept. Fr. Cold season.

2. *M. pruriens*, DC.; Fl. Br. Ind. ii. 187; Gamble Man. Ind. Timb. 121. The Cowitch or Cowhage plant. Vern. *Káunch*, *Gáunch*, Dún.

An annual twining herb. *Leaflets* 3-8 in. long, ovate or rhomboid, membranous, glabrescent above, adpressedly silky pubescent beneath, mucronate; rachis 6-10 in. long. *Racemes* 4-8 in. long, short-peduncled, drooping, 10-20-flowered. *Calyx* .25-.4 in. long, 2-lipped, with a few irritating bristles. *Corolla* 1.3-1.6 in. long, purplish. *Pod* 2-3 by .6-.8 in., 5-6-seeded, turgid, turned up at the end, longitudinally ribbed, covered with dense pale-brown bristles.

On hedges in the outskirts of villages and in abandoned village sites in SAHÁRANPUR and the DÚN. Fairly common.

The seeds and roots are used in medicine and the irritating hairs as a vermifuge.

Fl. Feb., Mar.

M. capitata, W. & A., Fl. Br. Ind. ii. 187,—is closely allied to the last species, but the flowers are corymbose, and the pod about twice as long and covered with deciduous bristles. Found in the SAHÁRANPUR SIWALIKS.

Fl. Rainy season. Fr. Cold season.

M. imbricata, DC., Fl. Br. Ind. ii. 185,—resembles *M. atropurpurea*, but the pod, besides being plaited, is broadly winged at both sutures. It is found in the DÚN. (*Mr. J. F. Duthie*.)

13. Erythrina, Linn.; G. P. n. 201.

1. *E. suberosa*, Roxb.; Fl. Br. Ind. ii. 189; Brandis For. Flora 140; Gamble Man. Ind. Timb. 121. Vern. *Dhaul Dhák*, *Madár*, Hind.

A moderate-sized deciduous tree; outer bark corky, light-grey, 1-2 in. thick, with deep irregular vertical cracks; branches armed with straight whitish conical prickles; young parts leaves beneath and inflorescence usually covered with soft tomentum. *Leaves* pinnately 3-foliate; stipels glanduliform. *Leaflets* 3-8 in. broad, often broader than long, rhomboid, green and glabrous above, matted with cottony down beneath. *Racemes* 9-15 in. long, crowded at the ends of the branches. *Flowers* bright-scarlet, 1.5-2 in. long, in fascicles of 2-3; pedicels .3-.5 in. long. *Calyx* campanulate, obsoletely 2-lipped in flower. *Corolla* much exserted, straight; standard 1.5-2 in. long, .5-.7 in. broad, narrowed into a short claw; wings .2-.3 in. long, falcate; keel-petals .6-.8 in. long, connate. *Stamens* 2-adelphous; upper stamen



free nearly to the base. *Ovary* stipitate, many-ovuled; style incurved, beardless; stigma capitate. *Pod* stipitate, 3-4 by 3-4 in., tapering at both ends, torulose, 4-6-seeded; seeds black.

Var. *glabrescens*, Prain, Journ. As. Soc. Beng. lxvi, Part ii. No. 2. 410—differs from the type in that the leaflets are glabrescent beneath at an early age, afterwards glaucous.

The type is occasionally met with along râus in the SIWALIKS, but the above variety is common in the Sâl forests of the DÚN and SAHÁRANPUR DIVISIONS, and also in the Tons and Jumna valleys in JAUNSA and TEHRI-GARHWAL, up to 4,000 ft.

Wood soft, white, spongy, but fibrous and tough, very light weighing 13-20lbs. per c. ft. It is used for scabbards, ladles, sieve-frames, and butter and ghee-pots. The tree is easily propagated by cuttings.

Leafless Jan., Feb. Fl. Mar., Apr. Fr. June.

14. *Spatholobus*, Hassk.; G. P. n. 208.

1. **S. Roxburghii**, Benth.; Fl. Br. Ind. ii. 193; Brandis For. Flora 143; Gamble Man. Ind. Timb. 122. Vern. *Maulá-* or *Malhá-bel*, Dún.

A large strong climber; branches grey-pubescent; stem with concentric layers of bast inside, which exudes a red gum when cut. *Leaves* pinnately 3-foliolate, stipellate; rachis 3-4 in. long. *Leaflets* 4-9 by 3-6 in., ovate or elliptic, acuminate, subcoriaceous, pubescent beneath, lateral oblique; lateral nerves 6-8 pairs, irregularly branched; petiolules 1-3 in. long. *Flowers* 3-4 in. long, white or reddish, in fascicles of 3 on large terminal panicles which are often 2-3 ft. long; pedicels very short. *Calyx* campanulate, grey-velvety, half the length of the flower; teeth acute, the two upper connate. *Standard* emarginate, longer than the keel, which is obtuse and nearly straight; wings free. *Stamens* diadelphous. *Ovary* shortly stipitate, 2-ovuled; style incurved, beardless; stigma capitate. *Pod* 3-5.5 by 1-1.3, suddenly narrowed into a stalk 4-6 in. long, softly brown-velvety, with only one seed near the end dehiscing from the apex only down to the seed.

Common in the Sâl forests of the DÚN and SAHÁRANPUR DIVISIONS, especially in the Siwalik range, where it does considerable harm to all trees by bending and distorting their stems, round which it twines with a very tight grip. In this respect it is the worst of all harmful climbers.

Wood soft and porous, but keeps on fire for a long time, for which purpose it is often used by people living near forests.

Fl. Sept.-Dec. Fr. Feb.-Apr.



33. LEGUMINOSÆ-PAPILIONACEÆ.

[*Butea*]
SL

15. *Butea*, Roxb.; G. P. n. 207.

1. *B. frondosa*, Roxb.; Fl. Br. Ind. ii. 194; Brandis For. Flora 142; Gamble Man. Ind. Timb. 123. Vern. *Dhák*, *Palás*, Hind.

A moderate-sized deciduous tree; bark fibrous, bluish-grey or light-brown outside, exuding a red juice when cut. *Leaves* pinnately 3-foliolate, stipellate; rachis 5-9 in. long; stipules and stipellæ tomentose, deciduous. *Leaflets* hard, rigidly coriaceous, glabrescent above, silky-tomentose beneath; lateral leaflets 6-8 by 5-7.5 in., obliquely ovate or broad-elliptic; petiolule 3-4 in. long, stout; terminal 5-8 by 4.5-7 in., rhomboid or broadly obovate from a cuneate base; lateral nerves 4-6 pairs, prominent. *Flowers* 2-3.5 in. long, fascicled on rigid axillary and terminal racemes which are 4-7 in. long; inflorescence bracts and calyx dark brown-velvety. *Calyx* 5 in. long, fleshy, grey-silky inside. *Petals* bright orange-red, equal, silvery-tomentose outside; standard 1 in. broad, recurved; keel incurved, beaked; wings falcate, adhering to the keel. *Stamens* 2-adelphous. *Ovary* shortly stalked, 2-ovuled; style filiform, curved, not bearded; stigma capitate. *Pod* 4-6 by 1.5-2 in., ligulate, firm, pendulous, silky-tomentose, abruptly narrowed to a stalk 5-7 in. long, with only one seed near the apex, indehiscent below the seed.

Common in the DÚN and SAHÁRANPUR FORESTS in blanks and open places, especially on water-logged soils as at Pathri. It is the most common indigenous tree of the UPPER GANGETIC PLAIN.

Wood dirty-white, porous, soft; annual rings indistinct; weight about 36 lbs. per c. ft. It is durable under water, and is used for well-curbs and piles. The bark of the roots yields a coarse brown fibre used for rough cordage and for caulking boats on the Ganges. The red juice exuded by the bark hardens into beads of ruby-coloured gum similar to kino, and is used as a substitute for it. The seeds also have a medicinal use. Lac is often collected on the branches. The leaves are used as plates and to wrap up parcels, and are also lopped for buffalo-fodder.

Leafless in March. New leaves and fl. Apr., May. Fr. June, July.

16. *Pueraria*, DC.; G. P. n. 218.

1. *P. tuberosa*, DC.; Fl. Br. Ind. ii. 197; Brandis For. Flora 141; Gamble Man. Ind. Timb. 123. Vern. *Surál*, *Sirál*, *Sarúr*, Dún and Saháranpur.

A twining shrub with stringy grey bark; young branches grey-pubescent; stem porous, producing large globose underground tubers which are often a foot long,—whence the specific name. *Leaves* pinnately 3-foliolate, stipellate; rachis 5-8 in. long. *Leaflets* 4-6 by 3-4 in., broad-ovate, acuminate, silky-pubescent when young, glabrescent



... and thinly pubescent beneath when mature, lateral oblique; main lateral nerves 6-8 pairs including the stronger basal pair; base truncate or subacute, 3-5-nerved; lateral petiolules 2-3 in. long. *Flowers* bright blue, in simple or paniced terminal racemes 6-12 in. long; bracts minute. *Calyx* about 2 in. long, densely silky; teeth shorter than the tube. *Corolla* about 4 in. long; standard spurred at the base; wings oblong-falcate; keel obtuse, nearly straight. *Stamens* usually monadelphous. *Ovary* sessile, many-ovuled; style filiform, much incurved, beardless; stigma capitate. *Pod* 2-3 in. long, flat, flexible, 3-6-seeded, contracted between the joints, clothed with long bristle-like brown hairs.

Remarkably common about Kálsi; also found throughout the DÚN and SAHÁRANPUR FORESTS.

The large tubers have a liquorice taste, and are eaten and used in medicine.

Leafless Nov.-May. Fl. Mar., Apr. Fr. Nov., Dec.

17. *Rhynchosia*, Lour.; G. P. n. 233.

1. *R. pseudo-cajan*, Camb.; Fl. Br. Ind. ii. 223.

An erect shrub, 4-6 ft. high; branches longitudinally ribbed; grey-tomentose. *Leaves* pinnately 3-foliolate, gland-dotted beneath; rachis 5-1 in.; stipules minute. *Leaflets* 5-2 by 3-1.5 in., ovate to rhomboid, very softly woolly-tomentose and reticulate beneath, strongly 3-nerved at the base; stipels 0. *Flowers* in short-peduncled compact corymbs; pedicels short. *Calyx* 2 in. long; teeth narrow-acuminate, densely woolly. *Corolla* 4-6 in. long, pale-yellow; keel incurved. *Stamens* 2-adelphous. *Ovary* subsessile, usually 2-ovuled; style long, much incurved; stigma capitate. *Pod* 1 by 4 in., oblong, straight, slightly compressed, 1-2-seeded, persistently grey-woolly.

Fairly common in fire-traces and grass-lands in the Tons valley and elsewhere in JAUNSAH and TEHRI-GARHWAL, up to 7,000 ft. Also at higher elevations in the SIWALIKS.

Fl. and fr. Apr.-June.

18. *Flemingia*, Roxb.; G. P. n. 235.

Generally moderate-sized shrubs. *Leaves* digiately 3-foliolate or simple, gland-dotted beneath. *Flowers* generally in cymes. *Calyx-tube* short; teeth narrow, the lowest often the longest. *Corolla* scarcely exerted; petals equal. *Stamens* 2-adelphous. *Ovary* subsessile, 2-ovuled; style filiform, beardless; stigma capitate. *Pod* small, turgid, usually 2-seeded.



33. LEGUMINOSÆ-PAPILIONACEÆ. [*Flemingia*.

Analysis of the Species.

Leaves simple; bracts persistent; folding, (hiding the flowers).

Leaves oblong-lanceolate, rounded at the base; axis of raceme zigzag.

1. *F. strobilifera*.

Leaves orbicular, cordate; axis of raceme straight.

2. *F. Chappar*.

Leaves digitately 3-foliolate; bracts caducous, not folding.

Branches triquetrous; bracts linear, exceeding the flowers

3. *F. stricta*.

Branches scarcely angled; bracts lanceolate, shorter than the flowers.

Racemes condensed, shorter than the petioles.

4. *F. conjesta*.

Racemes elongated, exceeding the petioles.

5. *F. semialata*.

1. ***F. strobilifera***, R. Br.; Fl. Br. Ind. ii. 227; Brandis. For. Flora 143.

An undershrub, usually about 5 ft. high; branches terete, velvety. *Leaves* simple, 3-6 by 1-1.8 in., oblong-lanceolate, subacute, rounded at the base, subcoriaceous, glabrescent above, thinly silky-pubescent beneath; petiole 2-7 in. long; stipule linear, scarious, 2-4 in. long. *Racemes* 3-6 in. long; rachis zigzag, downy; bracts 5-1 in. long, rather broader than long, deeply cordate, membranous, reticulate, downy, folded. *Flowers* 2-3 in. long; calyx hairy; corolla purple, little exserted. *Pod* 3-4 in. long, 2-seeded, downy.

Very Common in blanks in Sal forests in the SCHOOL CIRCLE.

The leaves are used for thatching.

Fl. Aug.-Nov. Fr. Cold season.

Very similar in appearance is *F. paniculata* Wall.; Fl. Br. Ind. ii. 227, but with paniced racemes, naked flowers and larger pods. Common near Lachiwála in the Dún. Fl. and fr. Mar.-May.

2. ***F. Chappar***, Ham.; Fl. Br. Ind. ii. 227; Brandis For. Flora 143. Vern. *Sálpán*, Hind.; *Ohháncra*, E. Dún.

gregarious undershrub often up to 7 ft. in height. *Leaves* simple, 2-4 in. diam., orbicular, cordate, acuminate, glabrescent above, more or less pubescent beneath, especially along the nerves, 3-nerved at the base lateral nerves 6-8 pairs above the basal; petiole 6-1.5 in. long. *Racemes* often paniced; rachis woody, pubescent; bracts 1 by 1.5 in., cordate, deeply emarginate, membranous, reticulate, folded, salmon brown when mature. *Flowers* 3-4 in.; corolla about half exserted. *Pod* 3-4 in. long, 2-seeded, downy.

Characteristic of the moister localities in the Dún, e.g., Káluwá, Lachiwála, Tirsál, Kánsrao, Motichúr, etc



The roots are used in native medicine.

Fl. Aug.-Oct. Fr. Cold season.

3. **F. stricta**, Roxb.; Fl. Br. Ind. ii. 228. Vern. *Bebār*, Garh.

A tall shrub, 6-10 ft. high; branches triquetrous, hairy. *Leaves* digitately 3-foliolate; petiole 4-5·5 in. long, 3-quetrous, furrowed; stipules 2 in. long, striate, caducous. *Leaflets* 6-12 by 2·5-4 in., oblong, narrowed at both ends, quite glabrous above, thinly hairy along the nerves beneath, very shortly petioluled, 3-5-nerved at the base; lateral nerves 12-16 pairs; glandular dots few, minute, black. *Racemes* 3-4 in. long, dense-flowered.; bracts 6-1 in., linear-subulate, scarioso, rigid; pedicels very short. *Flowers* 5 in. long; calyx-teeth linear, the lowest much longer than the others; corolla as long as the lowest tooth. *Pod* 5 in. long, glabrescent.

Common at Karwápáni in the DÚN, and also in low valleys in the HILLS.

Fl. Mar., Apr. Fr. Aug., Sept.

4. **F. congesta**, Roxb.; Fl. Br. Ind. ii. 228; Brandis For. Flora 143. Vern. *Banchhúí*, Dún.

An erect under shrub, 4-6 ft. high; branches slightly ribbed. *Leaves* digitately 3-foliolate; petiole 2·5-4 in. long, flattened; stipules 5 in. long, linear, caducous. *Leaflets* 4-6 by 2-3 in., ovate- or oblonge-lanceolate, glabrous above with brown or ruby-coloured glandular dots and pubescent and hairy along the nerves beneath; lateral oblique; base strongly 3-nerved; main lateral nerves about 6 pairs above the basal. *Racemes* dense, 1-2 in. long, sessile; bracts 12-25 in. long, lanceolate, membranous, not rigid, grey-silky outside, deciduous; pedicels very short. *Flowers* about 5 in. long; calyx densely silky, teeth lanceolate; corolla scarcely exerted. *Pod* 3-5 in. long, turgid, 2-seeded, obscurely downy; seeds 1 in. diam., shining, brown or blue-black.

Very common in the DÚN, especially in Sál forests.—Lachiwála, Karwápáni, etc.

A dye may be obtained from the hairs of the pod.

Fl. Apr.-Aug. Fr. Cold season.

5. **F. semialata**, Roxb.; Major Prain in Journ. As. Soc. Beng. lxi, Part ii. No. 2., 439-441; Brandis For. Flora 143; Gamble Man. Ind. Timb. 123. Syn.—*F. congesta*, var. *semialata*, Fl. Br. Ind. ii. 229. Vern. *Bará Sálpán*, Hind.

A shrub closely resembling the last, but generally much taller; the petiole is shorter and narrowly winged towards the upper end; glandular dots often absent, the racemes longer (3-6 in., and laxer and the calyx-teeth narrower.



33. LEGUMINOSÆ-PAPILIONACEÆ. [*Dalbergia*.]

As common as the last species, in much the same localities.

Fl. Apr.-Aug. Fr. Cold season.

F. prostrata, Roxb.; Major Prain in Journ. As. Soc. Beng. lxvi, Part ii, No. 2, 440; is simply a prostrate form of *F. congesta* with tawney-pubescent inflorescence. Found near Lachiwāla, Hardwar, etc.

19. *Dalbergia*, Linn. fil.; G. P. n. 236.

Trees, rarely climbing shrubs. *Leaves* imparipinnate; leaflets alternate, subcoriaceous, without stipels. *Flowers* small, in terminal or lateral panicles; bracts and bracteoles small. *Calyx* campanulate; teeth 5, short. *Corolla* exserted; standard broad; wings oblong; keel-petals shorter than the standard, connate at the tip. *Stamens* 9-10, diadelphous or monadelphous; anthers minute. *Ovary* stipitate, few-ovuled; style short, incurved, glabrous; stigma capitate. *Pod* thin, flat, coriaceous, 1-4-seeded, indehiscent.

Analysis of the Species.

- | | |
|---|----------------------------|
| Leaflets acuminate; stamens monadelphous. | 1. <i>D. Sissoo</i> . |
| Leaflets obtuse; stamens diadelphous. | |
| Leaflets 11-15; panicles large, lax | 2. <i>D. lanceolaria</i> . |
| Leaflets 17-25; panicles small, compact | 3. <i>D. hircina</i> . |

1. **D. Sissoo**, Roxb.; Fl. Br. Ind. ii. 231; Brandis For. Flora 149; Gamble Man. Ind. Timb. 124. Vern. *Shisham*, *Sissú*, Hind.; *Táli*, Punjab.

A fairly large tree; bark grey, somewhat reticulately longitudinally furrowed, exfoliating in narrow strips; young parts grey-downy. *Leaflets* 3-5, distinctly alternate, 1-2.5 in. diam., broad-ovate or rhomboid, tough, acuminate, glabrescent; lateral nerves very slender; rachis 2-4 in. long, zigzag, pubescent when young; petiolules 1-2 in. long. *Flowers* 2-3 in. long, pale-white, in racemes 1-1.5 in. long which are arranged in short axillary panicles. *Calyx* downy, about half the length of the flower. *Standard* with a long claw. *Stamens* 9, united in a sheath which is slit along the top. *Ovary* pubescent; style much shorter than the ovary; stigma large. *Pod* 2-3 by 3-5 in., strap-shaped, glabrous, pale-brown, a large proportion 1-seeded, narrowed at the base to a stipe 3-4 in. long. *Seeds* 25 in. long, kidney-shaped, flat.



Indigenous in the banks and beds of streams and on sandy soils in the DÚN and SAHÁRANPUR DIVISIONS, also in the Tons valley, JAUNSAE. Extensively planted in avenues and as nurses in tea-gardens in the DÚN.

The heartwood is brown, mottled with darker longitudinal veins, hard and close-grained; annual rings not distinctly marked; medullary rays very fine; pores uniformly distributed, joined by wavy white concentric bands; weight 45-55 lbs. per c.ft. "It is very elastic, seasons well, does not warp or split, and takes a fine polish".—*Sir D. Brandis*. It is highly esteemed for all purposes where strength and elasticity are required, its use being limited only by the supply. The twigs and leaves are lopped for fodder.

The tree can be easily raised from seed, *e.g.*, Sháhdera and Changá Mangá plantations in the PUNJAB, and also from root-cuttings, *e.g.*, at Jeypore in RAJPUTÁNA.

Leafless Jan., Feb. New leaves Feb., Mar. Fl. Mar.-May. Fr. Nov.-Feb., remaining long on the tree.

Allied to the Sissu is *D. latifolia*, Roxb., Fl. Br. Ind. ii. 231, the Blackwood or Rosewood tree of S. India. Vern. *Waláyti Shisham*, Hind. The bark is of a lighter colour and less furrowed, the leaflets thicker and emarginate, and the pod larger and firmer. The wood is even more valued than that of Sissu. It has a spreading crown with thick boughs and is often planted in avenues, *e.g.*, at Máyápur near Hardwar.

2. *D. lanceolaria*, Linn.; Fl. Br. Ind. ii. 235; Brandis For. Flora 151; Gamble Mar. Ind. Timb. 128.

A large deciduous tree with glabrous branches; bark smooth, greenish-grey, yellow inside but instantly turning brown. *Leaflets* 11-15, 1-2 by 6-12 in., elliptic or oblong, acute or emarginate, subcoriaceous, pale beneath. *Flowers* 2-4 in. long, dull-white, in large lax terminal and axillary panicles. *Calyx* about 1 in. long, silky outside. *Standard* obovate, 25 in. broad, clawed; keel short. *Stamens* 10, equally diadelphous. *Ovary* 3-ovuled, hairy at the base. *Pod* 2-3 by 5-7 in., narrowed at both ends, on a stipe 3-5 in. long, glabrous, flexible, bright-brown, generally 1-seeded, reticulate over the seed.

Occasionally met with in the SIWALIK TRACTS and in valleys in the OUTER HILLS. Very scarce. Along the Jhábri Sôt in the Máyápur Block. Also Ráiwála in the DÚN,—*Mr. A. Smythies*.

Wood white or yellow, moderately hard, not durable, no heart-wood; weight 33-44 lbs. per c. ft.

Fl. May June. Fr. Sept., Oct.



34. LEGUMINOSÆ-PAPILIONACEÆ. [*Dalbergia*.]

3. ***D. hircina***, Ham.; Fl. Br. Ind. ii. 236; Brandis For. Flora 151; Gamble Man. Ind. Timb. 124.

A small tree; young parts ferruginous-tomentose. *Leaves* 6-10 in. long. *Leaflets* 17-25, 1-1.5 by .6-.9 in., ovate or elliptic, emarginate or rounded at the tip, rather membranous, clothed with very minute grey hairs. *Flowers* about .25 in. long, in short congested axillary corymbose panicles, 1-2 in. long. *Calyx* about .1 in. long, densely pubescent. *Standard* obovate, .12 in. broad, gradually narrowed into a claw. *Stamens* 10, equally 2-adelphous. *Ovary* hairy. *Pod* 1-1.5 by .2-.3 in., 1-3-seeded, but less frequently 1-seeded than in the last two species.

OUTER HIMALAYA, e.g., Málköt, Sahansra-dhárá, below Mussoorie, etc.; also in TEHRI-GARHWAL, up to 5,500 ft.

Fl. Apr., May. Fr. July, Aug.

D. paniculata, Roxb., Fl. Br. Ind. ii. 236, is a tree which has leaves and pod exactly like those of *D. lanceolaria*, but the panicle is much smaller. The wood is of a curious structure, consisting of thin layers of fibrous tissue, resembling the inner bark, alternating with masses of white wood. The tree is very scarce in the SCHOOL CIRCLE, having been only once found in the E. SAHÁRANPUR SIWALIKS by Mr. N. Hearle.

20. *Sophora*, Linn.; G. P. n. 273.

1. ***S. mollis***, Grah.; Fl. Br. Ind. ii. 251; Brandis For. Flora 132; Gamble Man. Ind. Timb. 116. Vern. *Sákiná*, Garhwal,—a name also applied to all shrubby *Indigoferas*, which it somewhat resembles in foliage.

A low shrub with grey-downy branches; bark dark-grey, *Leaves* imparipinnate, 4-6 in. long. *Leaflets* 21-35, .5-1 in. long, elliptic, obtuse, emarginate, subcoriaceous, grey-green, finely grey-downy, prominently veined. *Racemes* 2-4 in. long, axillary, ascending. *Flowers* about 1 in. long, yellow, developed before the leaves. *Calyx* .15-.2 in. long, oblique, grey-downy. *Corolla* .6-.8 in. long; petals equal in length, clawed; standard broad. *Stamens* free; anthers versatile. *Ovary* stalked, many-ovuled; style incurved. *Pod* 3-4 in. long, 4-6 seeded, glabrous, distantly moniliform; joints with 4 crustaceous wings; seeds brown, hard, shining.

Sahansra-dhárá and probably also in similar other localities in the OUTER HIMALAYA.

The wood is used for fuel, and the leaves and twigs for fodder.

Fl. Mar., Apr. when leafless Fr. Rainy season.

The following plants of this SUB-ORDE deserve mention :—

1. *Æschynomene aspera*, Linn.; Fl. Br. Ind. ii. 152. The Sola plant. Vern. *Solá*, Hind. Stem erect, full of white pith-like light wood, 5-6 ft. high, 1-1.5 in. diam. Leaves imparipinnate; leaflets very small, numerous. Flowers yellow, about .7 in. long. Pod 2-2.5 by .3 in., long-stalked, with 3-6 separating joints. Found in swamps in the Pathri forest. The so-called pith is made into hat and is used as floats by fishermen. Fl. Rainy season. Fr. Nov., Dec. — G. P. n. 159.
2. *Uraria picta*, Desv.; Fl. Br. Ind. ii. 155. A little-branched erect perennial, 3-6 ft. high. Leaves paripinnate; leaflets 4-8 by .2-1 in., strongly net-veined beneath. Flowers small, in a dense cylindrical terminal raceme about a foot long. Pod twisted, of 3-6 white polished indehiscent by separating joints. Found about DEHRA DÚN and the OUTER HIMALAYA. — G. P. n. 174.
3. *Uraria lagopus* DC.; Fl. Br. Ind. ii. 156; has also been found in the same localities. Leaves 1- and 3-foliolate; leaflets 2-4 by 1.5-2 in., oblong, suboriaceous, strongly net-veined. Racemes long, both axillary and terminal; pedicels woolly. Joints 2-6, dark or pale.
4. *Uraria hamosa*. Wall.; Fl. Br. Ind. ii. 156; is an undershrub somewhat resembling a *Desmodium*. Leaves 1-3-foliolate; leaflets 3-5 by 2-3 in., oblong. Racemes 6-12 in. long, lax; bracts cuspidate. Corolla about .4 in. long, much exceeding the calyx. Joint 4-6, opaque. Found in swampy places in the DÚN, e.g., Nak-rauda.
5. *Alysicarpus vaginalis*, DC.; Fl. Br. Ind. ii. 158. A little-branched erect undershrub, 1-4 ft. high. Leaves simple or 3-foliolate; leaflets .5-2 in. long, broad or very narrow. Calyx about .12 in. long; corolla included. Pod .5-7 in. long, terete; joints indehiscent. Found at Lachiwála in the DÚN. — G. P. n. 176.
6. *Shuteria vestita*, W. & A.; Fl. Br. Ind. ii. 181. A slender climber with pinnately 3-foliolate leaves; leaflets 1-2 in. long, obovate-oblong, glabrescent. Flowers reddish, .3-.4 in. long, in axillary racemes, 1-4 in. long. Pod 1-1.5 in., linear, flat, recurved, 5-6-seeded. Found in the HILLS up to 6,000 ft.; Málkót, Korwá forest, etc. — G. P. n. 195.
7. *Atylosia mollis*, Benth.; Fl. Br. Ind. ii. 213. Vern. *Ban Sem*, Garhwal. A middle-sized twining shrub; young parts inflorescence and leaves beneath densely grey- or rusty-tomentose. Leaves 3-foliolate; leaflets 1.5-3.5 in. long, roundish-obovate, cuspidate, stipellate. Flowers .6-.8 in. long, yellow, in lax racemes; calyx grey-downy, half the length of the flower. Pod 1-2 by .4 in., 4-9-seeded, with transverse lines between the seeds. Common



33. LEGUMINOSÆ-PAPILIONACEÆ. [*Atylosia*.]

throughout the DŪN and OUTER HIMALAYA, and also along the foot of the SAHĀRĀPUR SIWALIKS. Fl. Dec., Jan. Fr. Mar., Apr.—G. P. n. 231.

8. *Aylosia scarabæoides*, Benth.; Fl. Br. Ind. ii. 215; is a twining biennial found in rau-beds in the SIWALIK TRACT. *Leaves* 3 foliolate; caulets 1.5 in. long, obovate-oblong, subcoriaceous, densely grey-down beneath. *Flowers* 2-6 on a short peduncle, about .5 in. long, yellow; corolla about 3-times the length of the calyx. *Pod* about 1 by .2 in., 4-6-seeded, densely grey-silky.

SUB-ORDER II. CÆSALPINIÆ.

Mostly trees or shrubs. *Leaves* abruptly pinnate or bipinnate, sometimes 2-foliate or simple and 2-lobed; leaflets rarely stipellate. *Flowers* 2-sexual, generally irregular. *Calyx* divided to or nearly to the base; lobes usually 5, rarely valvate, generally concave. *Petals* 5, imbricate, quite free, slightly unequal, the upper or odd petal innermost. *Stamens* normally 10, usually free, often declinate; anthers large. *Pod* often indehiscent. *Seeds* sometimes albuminous.

Analysis of the Genera.

Leaves bipinnate	1. CÆSALPINIA.
Leaves pinnate.	
Petals 5; stamens free, generally all perfect	2. CASSIA.
Petals 3; stamens monadelphous, only 3 perfect.	3. TAMARINDUS.
Leaves simple, 2-lobed	4. BAUHINIA.

1. Cæsálpinia, Linn.; G. P. n. 308.

Trees, erect shrubs, or prickly climbers. *Leaves* abruptly bipinnate. *Flowers* showy, yellow, in axillary or terminal racemes, the latter often corymbose. *Calyx*-lobes 5, imbricate, hood-shaped, many times larger than the tube, the lowest largest. *Petals* 5, usually clawed, the uppermost smaller than the others. *Stamens* 10, free, declinate; anthers versatile. *Ovary* sessile, few-ovuled; style filiform. *Pod* various.

*Analysis of the Species.*

- Pod armed with wiry prickles . . . 1. *C. Bonducella*.
Pod not armed, quite smooth . . . 2. *C. sepiaria*.

1. ***C. Bonducella***, Fleming; Fl. Br. Ind. ii. 254; Brandis For. Flora 156; Gamble Man. Ind. Timb. 135. Vern. *Kath Karanj*, Hind.

A scandent prickly shrub. *Leaves* over a foot long; pinnae 6-8 pairs, 3-5 in. long; stipules large, 2-fid; rachis and its branches armed with recurved prickles. *Leaflets* 6-10 pairs on each pinna, opposite, 7-1 by 4-6 in., oblong or elliptic, obtuse, mucronate, membranous, downy beneath, minutely petioluled. *Racemes* 6-12 in. long, gradually denser towards the top; pedicels 2-3 in., downy; bracts 5 in. long, linear-lanceolate, generally recurved at the tip, exceeding the flower-buds. *Calyx* 2-3 in. long, finely rusty-tomentose. *Petals* 4-5 in. long, oblanceolate, yellow, the smallest sometimes spotted with red. *Pod* 2-3 by 1-5-2 in., coriaceous, dehiscent, thickly beset with sharp wiry prickles 2-3 in. long. *Seeds* 2-3, 7 in. long, globose or ovoid, shining, lead-coloured, with numerous very fine horizontal cracks when dry.

SAHÁRANPUR and the DÚN, generally in abandoned village sites or in hedges; Sháhjahánpur, Dúdhli, Tháno, Khairi, etc. Also at Kálsi in JAUNSAE.

The tender shoots and seeds are used medicinally, the farina of the cotyledons, which is white and very bitter, being considered a good substitute for quinine. It makes a good hedge-plant.

Fl. Aug., Sept. Fr. Cold season.

2. ***C. sepiaria***, Roxb.; Fl. Br. Ind. ii. 256; Brandis For. Flora 156; Gamble Man. Ind. Timb. 135. The Mysore-thorn. Vern. *Alai*, Dún; *Ari*, Jaunsar; *Karanj*, Hind.

A large prickly climber, pubescent or downy; prickles strong, recurved or less frequently curved upwards. *Leaves* 9-16 in. long; pinnae 6-10 pairs, 2-4 in. long; stipules semisagittate, deciduous. *Leaflets* 8-12 pairs on each pinna, opposite, 6-8 by 2-4 in., oblong, very obtuse, green and glabrous above, glaucous beneath, minutely petioluled. *Racemes* simple, about 1 ft. long; pedicels 7-1 in. long, jointed at the top; bracts lanceolate, rusty-tomentose. *Calyx* about 5 in. long, deeply 5-lobed, pubescent or tomentose. *Petals* 5-7, in. long, bright-yellow. *Stamens* 5 in. long, exserted; filaments thickened and woolly at the base. *Pod* 2-5-4 by about 1 in., somewhat woody, glabrous, obliquely cuspidate, tardily dehiscent. *Seeds* 4-8, ovoid, 4 in. long, rather compressed, smooth, mottled brown and black.



33. LEGUMINOSÆ-CÆSALPINIÆ. [*Cæsalpinia*.]

Common in swampy localities in the DŪN, and also in ravines in JAUNSAE and TEHRI-GARHWAL, ascending to 6,000 ft.—Nakraunda, Jogiwāla, Bagūr Block near Kathiān, Tons valley, etc.

It is an excellent hedge-plant. The bark is astringent and may be used for tanning.

Fl. Mar.-June. Fr. Rainy season.

2. Cassia, Linn ; G. P. n. 326.

1. **C. Fistula**, Linn.; Fl. Br. Ind. ii. 261; Brandis For. Flora. 164; Gamble Man. Ind. Timb. 136. Vern. *Āmaltās*, Hind.; *Kirāla*, DŪn; *Siñāra*, Garhwal.

A moderate-sized tree, wholly glabrous; bark greenish-grey, smooth up to middle age. *Leaves* paripinnate, 1-2 ft. long; rachis terete. *Leaflets* 4-8 pairs, 3-6 by 2-3 in., ovate or ovate-oblong, subcoriaceous, acuminate, entire; lateral nerves parallel, numerous. *Flowers* bright-yellow, in thyrsoid pendulous axillary racemes 12-18 in. long; pedicels 3-1 in., gradually smaller towards the apex of the raceme. *Calyx* 2-4 in. long, glabrous, caducous. *Petals* 3-1 in. long, shortly clawed, nearly equal. *Stamens* of 3 kinds,—3 about 1 in. long behind the ovary with large oblong anthers, 4-6 about 4 in. long in front of the ovary with diverging anther cells, the remaining 3-1 shorter and more slender with indehiscent anthers. *Ovary* shortly stipitate; style incurved; stigma terminal. *Pod* up to 2 ft. long, 1 in. diam., cylindrical, smooth, hard, indehiscent, dark-brown when fully ripe, obscurely transversely ribbed, septate into numerous 1-seeded cells. *Seeds* about 4 in. diam., compressed, albuminous, parallel with the septa.

Common throughout the DŪN and SAMĀRANPUR FORESTS; also found in low valleys up to 4,000 ft. in JAUNSAE and TEHRI-GARHWAL, e.g., Āmlāwā valley up to Saiā.

The heartwood is yellowish or brick-red, tough, very hard and extremely durable, excellent for posts, carts and agricultural implements; weight about 60 lbs. per c. ft. The black-coloured sweetish pulp of the ripe fruit is a strong purgative, and is an ingredient of spiced native tobacco. The gum exuded by the bark is astringent. The bark is used for tanning and dyeing. The twigs are often lopped for cattle fodder. It is a very handsome tree, and is often cultivated for ornament.

Scarcely ever wholly leafless. New leaves and fl. Apr.-July. Fr. Cold season.



The following smaller plants belong to this Genus:—

1. *C. occidentalis*, Linn.; Fl. Br. Ind. ii. 262. Vern. *Chakunda*, Hind. A diffuse undershrub. *Leaflets* 2-4 by '6-1'3 in. elliptic-lanceolate, acuminate. *Flowers* '5-'7 in. diam.; petals yellow with reddish veins. *Pod* 3 by '4 in., compressed, glabrous. A weed common in blanks and along forest roads, especially in the DÚN.

2. *C. Tora*, Linn.; Fl. Br. Ind. ii. 263. Vern. *Panwár*, Dún. A gregarious annual with a whitish stem. *Leaflets* about 3 pairs 1-1'7 by '7-1'3 in., obovate, mucronate. *Flowers* '4 in. diam., orange-yellow; sepals concave. *Pod* 6-9 by '15 in., tapering, curved, flexuose; seeds truncately cylindrical, about '2 in. long, length parallel to the sutures. A common weed in blanks and about villages in the DÚN and in SAHÁRANPUR. Fl. July, Aug. Fr. Oct.-Dec.

3. *C. mimosoides*, Linn.; Fl. Br. Ind. ii. 266. A diffuse perennial. *Leaflets* very numerous, '5 by '1 in., linear-oblong, acuminate. *Flowers* yellow, '3 in. long, in 2-3-flowered axillary racemes. *Pod* flat, 2-2'5 by '2 in., 10-14-seeded. DÚN,—Ráipur, Rámgarh, Lachiwála, etc. Fl. July, Aug. Fr. Sept.-Nov.

3. Tamarindus, Linn.; G. P. n. 348.

1. **T. indica**, Linn.; Fl. Br. Ind. ii. 273; Brandis For. Flora 163; Gamble Man. Ind. Timb. 142. The Tamarind tree. Vern. *Imli*, *Ámli*, Hind.

A large unarmed tree; bark dark-grey, with longitudinal fissures. *Leaves* abruptly pinnate; rachis 2-5 in. long; stipules small, caducous. *Leaflets* 10-20 pairs, opposite, '5-'7 by '15-'2 in., linear-oblong, obtuse, often emarginate, subcoriaceous, glabrescent, very minutely petioluled, with intramarginal nerves. *Flowers*, in few-flowered lax sub-terminal racemes. *Calyx-tube* turbinate; teeth lanceolate, the two lowest connate. *Petals* only the 3 upper developed which are '4-'6 in. long, pale-white, variegated with red stripes, the middle one hooded, the two lower reduced to scales. *Stamens* only 3 perfect, monadelphous, the others reduced to bristles; anthers versatile. *Ovary* stipitate, the stalk adnate to the calyx-tube; ovules many; stigma capitate. *Pod* 3-8 by '8-1 in., oblong, slightly compressed, usually falcate, many-seeded, indehiscent, with a crustaceous brittle epicarp which ultimately cracks irregularly; sutures indistinct. *Seeds* '5 in. diam., compressed, with a dark-brown or black hard shining smooth testa, embedded in a brown pulpy mesocarp.

Cultivated throughout the DÚN and SAHÁRANPUR DISTRICTS for its fruit; almost wild towards Hardwar.



33. LEGUMINOSÆ-CESALPINIÆ [Tamarindus.

Sapwood yellowish-white, hard and close-grained. Very old trees produce a scanty ebony-like dark purplish-brown heartwood which is very durable; annual rings indistinct; weight about 75lbs. per c. ft. "Wood highly prized though extremely difficult to work. It is used for wheels, mallets, planes, rice-pounders, oil and sugar mills, and is an excellent wood for turning"—*Mr. J. S. Gamble*. The fruit is an article of food and is also used in medicine. The leaves make an agreeable curry, and the inner substance of the seeds a strong cement.

Fl. May, June. Fr. Mar., Apr., i.e., 10-11 months after flowering.

4. Bauhinia, Linn.; G. P. n. 333.

Trees, shrubs, or climbers. *Leaves* simple, more or less distinctly 2-lobed, palmately nerved. *Flowers* white, pink or purple, in simple or paniced racemes. *Calyx* gamosepalous, turbinate or tubular; limb 5-cleft, or split on one side (spathaceous) and minutely 5-toothed at the apex. *Petals* 5, sub-equal, usually clawed. *Stamens* 10, free, all or 3-5 perfect, the others rudimentary or absent; anthers versatile. *Ovary* stalked, many-ovuled. *Pod* linear or oblong, flat, dehiscent or indehiscent. *Seeds* albuminous.

Analysis of the Species.

Fertile stamens 10; pod indehiscent.

Leaves not acid; calyx spathaceous; pod rigid, falcate. 1. *B. racemosa*.

Leaves acid; calyx 5-cleft; pod flexible, straight. 2. *B. malabarica*.

Fertile stamens 3-4, rarely 5; pod dehiscent. 3. *B. retusa*.

Leaves cleft only at the tip or not cleft at all. 4. *B. Vahlia*.

Leaves deeply cleft. 5. *B. purpurea*.

A climber; leaves usually broader than long. 6. *B. variegata*.

Trees; leaves as long as broad. 7. *B. variegata*.

Leaves cleft nearly half way down; calyx-tube shorter than the limb. 8. *B. variegata*.

Leaves cleft scarcely along a third of their length; calyx-tube as long as the limb. 9. *B. variegata*.

1. *B. racemosa*, Lam.; Fl. Br. Ind. ii. 276; Brandis For. Flora 159; Gamble Man. Ind. Timb. 139. Vern. *Jhanjhorá*, *Jhinjhorá*, *Dún* and *Saháranpur*; *Pápri*, *Saháranpur*.



A small deciduous tree; bark dark bluish-brown, rough, with numerous deep vertical cracks. *Leaves* broader than long, 8-2 by 1-3 in., cleft nearly half way down, 7-9-nerved, slightly cordate, coriaceous, grey-pubescent beneath; petiole 5-7 in. long. *Racemes* 3-5 in. long, terminal and leaf-opposed; rachis downy. *Flowers*, pale-white, about 5 in. long, on short pedicels; buds oblongeolate, pointed at the tip; bracts subulate, deciduous. *Calyx-tube* about 1 in. long; limb about three times as long, entire, 5-toothed, at length reflexed. *Petals* oblongeolate, as long as the calyx-limb. *Stamens* 10, all perfect, united at the base. *Stigma* sessile. *Pod* 5-8 by 7-1 in., sometimes longer, turgid, rigid, falcate, 12-20-seeded, glabrous, irregularly reticulate outside.

Common in blanks and the drier parts of forests in SAHÁRANPUR and the DÚN.

Wood light-brown, hard, weighing 50 lbs. per c. ft. It is fairly good, but not used except for fuel. The fibres of the bark are used to make ropes.

Fl. Mar.-June. Fr. Cold season.

2. **B. malabarica**, Roxb.; Fl. Br. Ind. ii. 277; Brandis For. Flora 159; Gamble Man. Ind. Timb. 139. Vern. *Amli*, Hind.; *Khat Pápri*, Saháranpur; *Khatta Jhunjhorá* or *Jhinjhorá*, Imli, Dún; *Khatuá*, Garhwal.

A moderate-sized deciduous tree; bark dark-brown, exfoliating in thin long strips, fibrous, red inside. *Leaves* acid, broader than long, 1.5-4 by 2-5 in., cleft through a third of the length, 7-9-nerved, slightly cordate, coriaceous, glabrate and glaucous beneath; petiole 8-1.2 in. long, rusty-pubescent. *Racemes* axillary, sessile, 1.5-2 in. long, often 2-3 together. *Flowers* 5 in. long, dull-white, on very slender pedicels which are 1 in. long; buds obovoid, rounded at the tip. *Calyx* brown-tomentose; tube 1.5 in. long; limb slightly longer, 5-cleft. *Petals* equal, spathulate, 4-5 in. long. *Stamens* 10, all perfect, alternately longer and shorter, slightly united at the base. *Style* produced. *Pod* 7-12 by 7-1 in., on a stalk 1 in. long, flat, flexible, many-seeded, more or less straight, gradually tapering to the tip, marked with regular reticulate veins which, starting diagonally from both sutures, meet in the middle.

Common in the DÚN and SAHÁRANPUR FORESTS, especially in the Sál areas.

Wood light reddish-brown, coarse-grained; weight 48 lbs. per c. ft. It is never used, except for fuel. The acid leaves are eaten.

Fl. Aug.-Oct. Fr. Jan.-May.



33. LEGUMINOSÆ-CÆSALPINIÆE [Bauhinia.

3. **B. retusa**, Ham.; Fl. Br. Ind. ii. 279; Brandis For. Flora 161; Gamble Man. Ind. Timb. 141. Vern. *Semlá*, Hind.

A moderate-sized tree; individuals that escape tapping attaining a fairly large size; bark dark-brown, with a few shallow vertical cracks, but usually much disfigured by the diagonal cuts that are made to tap its gum. *Leaves* 4-6 in. diam., rather broader than long, entire or cleft only at the tip, cordate or truncate, 9-11-nerved, coriaceous, more or less pubescent beneath; petiole 1.5-3.5 in. long. *Flowers* 5 in. long, in large corymbosely branched terminal panicles; buds ovoid-globose. *Calyx* 2.3 in. long, split into 2-3 sections nearly to the base. *Petals* 3.4 in. long, obovate, yellow, with red spots and purple veins, clawed, pubescent. *Stamens* only 3 perfect. *Ovary* hairy below; stipe adnate to the calyx-tube; style produced; stigma large. *Pod* 4-7 by 1.2-1.5 in., flat, oblanceolate, deep-red until ripe, glabrous, hard, tardily dehiscent; seeds flat, about .5 in. diam., dark-brown, smooth.

Fairly common in the SIWALIK TRACT and in places in the OUTER HIMALAYA: Málkot, Paléd, Bindál-nálá near Dehra, Timli Pass, Sháhjánpur Ráu, etc.

Wood reddish-white, hard, close-grained; weight 58 lbs. per c. ft. It is not used. A clear gum resembling gum-arabic is collected by making cuts in the bark, and is largely exported from the Dún. It is used in medicine, and in the manufacture of sweetmeats.

Fl. Sept.-Nov. Fr. Feb., Mar.

4. **B. Vahlia**, W. & A.; Fl. Br. Ind. ii. 279; Brandis For. Flora 161; Gamble Man. Ind. Timb. 139. Vern. *Máljhan*, *Málo*, Hind.

A gigantic evergreen climber; branchlets often terminating in a pair of revolute tendrils; young branches, petioles and leaves beneath especially along the nerves densely rusty- or grey-velvety. *Leaves* very variable in size, often up to 18 in. across, as broad as long or broader, deeply cordate, 11-15-nerved, cleft through about a third of the length, sub-coriaceous, dark-green and glabrescent above, more or less downy beneath; lobes obtuse, rounded; petiole 3-6 in. long, stout. *Flowers* white, in terminal corymbs or corymbose racemes; pedicels 1-2.5 in. long, slender, with a lanceolate caducous bract at the base and a pair of small bracteoles above the middle, all densely woolly. *Calyx-tube* 2-3 in. long; limb .6-1 in. long, splitting into two lobes, densely rusty-tomentose. *Petals* 1-1.7 in. long, obovate, shortly clawed, white-canescient along the middle outside. *Stamens* 3. *Ovary* hairy, adnate to the calyx-tube. *Pod* 9-12 by 2-3 in., flat, woody, rusty-velvety. *Seeds* 8-12, about 1 in. diam., flat.

Common in the DÚN and SAHÁRANPUR FORESTS, especially in moist localities and shady hill-slopes; also in the OUTER HIMALAYA up to 3,000 ft.



It often attains enormous size, stems 4-5 ft. in girth not being uncommon. There is a famous climber on the left bank of the Kasumri Rān above the temples which measured 6 ft. 7 in. in girth in January 1899. The stem consists of a mass of phloem tissue which is traversed by strands of xylem of various thicknesses round the pith, together presenting a beautiful floral design on a transverse section. "Its large flat leaves are sewn together and used as plates, cups, rough table-cloths, umbrellas and rain caps; its pod is roasted and the seeds eaten; its bark is made into rough ropes"—*Mr. J. S. Gamble*. It is, however, one of the greatest enemies of forest trees, and every attempt is made to exterminate it where possible.

Fl. Apr.-June. Fr. Cold season.

5. **B. purpurea**, Linn.; Fl. Br. Ind. ii. 284; Brandis For. Flora. 160; Gamble Man. Ind. Timb. 140. Vern. *Khairwāl Dún*; *Khairwāl Pāpri*, Sahāranpur; *Guirāl*, Garhwal.

A moderate-sized tree; bark ash-coloured or dark-brown; young parts covered with brown pubescence. *Leaves* 3-6 in. long, rather longer than broad, 9-11-nerved, cordate, less frequently truncate, coriaceous, cleft about half way down; lobes usually sub-acute, sometimes over-lapping at the inner margins; petiole 1-1.5 in. long. *Flowers* deep rose, in paniculate or corymbose racemes; pedicels .2-5 in. long, tomentose; buds obovoid or oblong, acute, strongly 5-ribbed. *Calyx-tube* .3-4 in. long; limb nearly twice as long, slit on one side, 5-toothed at the apex. *Petals* reddish, 1.5-2 in. long, oblanceolate, clawed, with a distinct midrib and fine straight lateral veins. *Stamens* usually 3 fertile, slightly shorter than the petals; staminodes filiform, of varying lengths. *Ovary* long-stalked; style long; stigma large, oblique. *Pod* 6-10 by .6-8 in., on a tomentose stipe .6-1 in. long, thick, pointed, slightly decurved, greenish-purple, pubescent along the sutures, late in dehiscing; seeds 12-15.

Common in the SAHĀRANPUR SIWALIKS; also found in the DŪN and in the Tons valley in JAUNSAIR.

The heartwood is of a reddish-brown colour, moderately hard, fairly close-grained; weight about 50 lbs. per c. ft. It is used for agricultural implements and in construction. The bark is used for tanning, the leaves are lopped for cattle and camel fodder, and the flower-buds are eaten cooked or pickled. Often cultivated for its flower.

Fl. Sept.-Nov. Fr. Jan.-Mar.

6. **B. variegata**, Linn.; Fl. Br. Ind. ii. 284; Brandis For. Flora 160 Gamble Man. Ind. Timb. 140. Vern. *Kachnār*, Dún; *Goriáo*, Jaunsar.



33. LEGUMINOSÆ-CÆSALPINIÆÆ. [*Bauhinia*.]

A fairly large tree, closely resembling the last species. *Leaves* 4-6 in. long, as broad as long or sometimes broader, usually deeply cordate, 11-15-nerved, sub-coriaceous, cleft through about a quarter; lobes obtuse; petiole 1-1.5 in. *Flowers* large, fragrant, sessile or shortly pedicelled, in few flowered lateral corymbs. *Calyx-tube* 5-1.2 in. long, slender; limb spathaceous, as long as the tube, 5-toothed at the apex, pubescent outside. *Petals* about 2 in. long, obovate or oblong, generally four white and one red, with a strong midrib and red or purple lateral veins radiating from near the base. *Fertile stamens* 5, rarely 3 or 4. *Ovary* long-stalked; style long; stigma minute. *Pod* 6-10 by 7-9 in., hard, flat, glabrous, slightly decurved, dehiscent; seeds 10-15.

Occurring in the same localities as the last species but is more common in the DŪN and in valleys in the HILLS, e.g. Āmlāwa and Tons valleys.

Wood grey, moderately hard; weight 42 lbs. per c. ft. Economic uses as of the last species.

Fl. Feb.-Apr. when leafless. Fr. Rainy season.

SUB-ORDER III. MIMOSÆÆ.

Usually trees or shrubs. *Leaves* abruptly bipinnate. *Flowers* regular, minute, in heads or spikes. *Sepals* 5, usually combined, valvate. *Petals* 5, more or less connate, valvate. *Stamens* definite or indefinite, hypogynous, generally much exserted; anthers small. *Pod* various. *Seeds* without albumen.

Analysis of the Genera.

Joints of pod separating; stamens 8-10, free	.	.	1. MIMOSA.
Joints of pod not separating; stamens indefinite.			
Armed.* Stamens free	.	.	2. ACACIA.
Unarmed. Stamens more or less connate	.	.	3. ALBIZZIA.

* Some Australian Acacias are not armed.

1. *Mimosa*, Linn.; G. P. n. 387.

1. *M. rubicaulis*, Lam.; Fl. Br. Ind. ii. 291; Brandis For. Flora 172; Gamble Man. Ind. Timb. 148. Vern. *Alây*, Dún; *Al*, Saháranpur.

A straggling prickly shrub; young branches red (whence the specific name), closely ribbed, thickly beset with short recurved prickles. *Leaves* 4-6 in. long, with prickly rachis; pinnae usually opposite, 4-10 pairs, 1-1.5 in. long, not armed. *Leaflets* 12-28 on each pinna, .15-.3 in. long, oblong, unequal-sided, caducous. *Flowers* tetramerous, red to white, in globose heads which are .4-.6 in. across; peduncles 1-2 in. long. *Calyx* campanulate, shortly toothed. *Petals* .04 in. long, connate at the base. *Stamens* usually 10, exserted. *Pod* 3-4 by .4 in., linear-oblong, 5-10-seeded, slightly falcate, glabrous; the joints square, separating from the sutures before dehiscing.

Common in grass-lands and fallows in the Dún and in ráu-beds in the SAHÁRANPUR SIWALIKS. Also found in valleys in the HILLS up to 5,000 ft.

Heartwood red, hard; weight 40-50 lbs. per c. ft. It can be used for pegs and such other purposes.

Fl. July-Sept. Fr. Nov.-Jan.

M. pudica, Linn.; Fl. Br. Ind. ii. 291,—the well known Sensitive plant, Vern. *Lájiwanti*, Hind.;—is cultivated and also found wild in waste lands in the DÚN. *Rachis* 1-1.5 in. long. *Pinnae* 1.5-2 in. long, approximate at the end of the rachis and spreading to look like digitate, very sensitive. *Leaflets* .2-.3 in. long, sensitive. *Flower-heads* long-peduncled. *Pod* .5-.8 in. long with densely-prickly sutures. Fl. Aug., Sept. Fr. Nov., Dec.

2. *Acacia*, Willd.; G. P. n. 391.

Erect or climbing shrubs or trees, armed with stipular spines and prickles (in India). *Leaves* bipinnate; leaflets minute. *Flowers* yellow or white, hermaphrodite or polygamous, in globose heads or cylindrical spikes. *Calyx* campanulate, short-toothed. *Petals* valvate, more or less connate towards the base. *Stamens* indefinite, free, much exserted; anthers minute. *Pod* dry or fleshy, dehiscent or indehiscent; seeds compressed.



33. LEGUMINOSÆ-MIMOSÆÆ.

[*Acacia*.]
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Analysis of the Species.

Trees or erect shrubs.

Flowers in axillary globose heads; spines straight.

Pod short, cylindrical; seeds in two rows. 1. *A. Farnesiana*.

Pod long, not cylindrical; seeds in one row.

Pod convex, downy, deeply indented between the seeds. 2. *A. arabica*.

Pod flat, glabrous, slightly contracted between the seeds. 3. *A. eburnea*.

Flowers in axillary cylindrical spikes; spines recurved. 4. *A. Catechu*.

Climbing shrubs; (flowers in copiously panicked globose heads).

Pod succulent, thick. 5. *A. concinna*.

Pod dry, thin.

Leaflets 5 by 15 in., few; stem fluted. 6. *A. Intsia*.

Leaflets 3 by 05 in., numerous; stem not fluted. 7. *A. pennata*.

1. ***A. Farnesiana***, Willd.; Fl. Br. Ind. ii. 292; Brandis For. Flora 180; Gamble Man. Ind. Timb. 150. Vern. *Walāyti Kikar*, Hind.

A thorny shrub, 12-15 ft. high, with dark-brown smooth bark; branches marked with grey dots, armed with stipular spines 3-5 in. long. *Leaf-rachises* 1.5-2 in. long, downy; *pinnae* 4-8 pairs, 1-1.5 in. long. *Leaflets* 20-40 on each pinna, very small, rigid. *Flowers* bright-yellow, exceedingly sweet-scented, in globose heads which are 4-6 in. diam.; *peduncles* 5-8 in. long, slender, crowded in the axils of the leaves, with a whorl of bracts at the apex. *Calyx* and *corolla* 5-toothed. *Pod* 2-3 by 5 in., cylindrical, turgid, dark-brown, with a double row of seeds.

It is a native of tropical America and is, no doubt, introduced, but is quite wild now in the DŪN and SAHĀRANPUR districts, e.g., beds of the Suswā river; Pathri forest; Barkalā, etc. Also cultivated in gardens for its flower.

Wood white, hard, close-grained; weight about 50 lbs. per c. ft. An excellent perfume is made from the flower.

Fl. Jan.-Mar. Fr. June, July, but remains long on the plant.

2. ***A. arabica***, Willd.; Fl. Br. Ind. ii. 293; Brandis For. Flora 180; Gamble Man. Ind. Timb. 151. Vern. *Babul*, Hind.; *Kikar*, Sahāranpur and the Punjab.

A moderate-sized tree with a large spreading crown; bark dark-brown, almost black, much fissured; spines 5-2 in. long, white,



smooth, sharply pointed. *Leaves* 1-2 in. long; rachis and pinnae downy; pinnae 3-6 pairs, 5-1.2 in. long, with several glands at their insertions. *Leaflets* 10-20 pairs, 1-2 in. long, linear, glabrous. *Flowers* yellow, fragrant, in axillary globose heads which are about 5 in. diam.; peduncles in fascicles of 3-5, short, slender, grey-downy, with a whorl of bracts above the middle. *Calyx* cup-shaped, .04 in. long. *Corolla* twice the length of the calyx. *Pod* generally solitary, 4-6 by 5.6 in., 8-12-seeded, stalked, convex, rather fleshy, deeply indented between the seeds, densely grey-downy, tardily dehiscent.

Cultivated in the SAHÁRANPUR DISTRICT, and apparently self-sown in many places, e.g. at Ránipur, Jawálapur, Tirá, etc.

Sapwood large, whitish; heartwood becoming reddish or dark brown on exposure; weight about 55 lbs. per c. ft. The latter is hard and very durable, and is used for wheels, well-curbs, sugar- and oil-presses, rice-pounders and for ploughs and other agricultural implements. The gum is largely collected and used for various purposes. The pod is a favorite food for cattle, sheep and goats, and is very rich in tannin before ripening.

Fl. Rainy season. Fr. Cold season.

3. **A. eburnea**, Willd. ; Fl. Br. Ind. ii. 293 ; Brandis For. Flora 183 ; Gamble Man. Ind. Timb. 151. Vern. *Pahári Kíkar*, Saháranpur ; *Kíkar*, Dún.

A small deciduous tree with rough dark-grey bark; spines generally dark-brown and about .5 in. long, the larger ones white and up to 2 in. long. *Leaves* 1-1.5 in. long; pinnae usually 4 pairs, 3-5 in. long, all or at least two pairs with a gland at the insertion. *Leaflets* 8-12 pairs, about .1 in. long, oblong. *Flowers* pale-yellow, in axillary globose heads about .5 in. diam.; peduncles 1 in. long, filiform, with an involucre of connate bracts about .3 in. from the base. *Calyx* funnel-shaped, .04 in. long. *Corolla* about twice the length of the calyx. *Pod* 2-4 on the same peduncle, 3-6 by .25 in., narrow-linear, flat, stalked, rigidly coriaceous, glabrous, shining, slightly contracted between the seeds.

Common in the SAHÁRANPUR SIWALIKS, generally in beds of ráus, where it is associated with Khair. Also found in the DÚN, e.g. at Sáhanspur and Dharmawála.

Wood yellowish-white, extremely hard, splitting in drying; weight 52 lbs. per c. ft. It is used chiefly as fuel, especially for lime-burning.

Fl. Cold season, rarely Mar., Apr. Fr. about 4 months after flowering, generally Apr., May.

4. **A. Catechu**, Willd. ; Fl. Br. Ind. ii. 295 ; Brandis For. Flora 186 ; Gamble Man. Ind. Timb. 153. Vern. *Khair*, Hind.



33. LEGUMINOSÆ-MIMOSÆÆ.

[*Acacia*.]

A moderate-sized tree with thorny branches ; stipular spines in pairs, short and recurved, shining-brown or nearly black ; bark rough, dark-grey or ash-coloured, exfoliating in long narrow rectangular flakes. *Leaves* 4-7 in. long ; rachis prickly and with 4-5 glands ; pinnae 20-60, 1-1·3 in. long. *Leaflets* 60-100 on each pinna, about 15 in. long, ligulate. *Flowers* pale-yellow or cream-coloured, in lax axillary cylindrical spikes which are 3-4 by 4 in. ; peduncle 5-7 in. *Calyx* about 0·4 in. long, grey-tomentose. *Corolla* two to three times longer than the calyx. *Stamens* numerous, much exserted. *Pod* 2-3·5 by 5-6 in., on a stalk 2-3 in. long, straight, flat, dry, dark-brown, shining, 5-6-seeded. *Seeds* 2 in. diam., orbicular, flat, dark-brown.

Common in the DŪN and the SAHĀRANPUR SIWALIKS, generally in rāu-beds, either pure or mixed with Sissu ; occasionally also in mixed scrub forests and on hill-sides away from the rāus.

Sapwood comparatively large, yellowish-white, not durable. Heartwood dark-red, so hard as to be proof against whiteants, hence very durable, seasons well and takes a fine polish. The weight varies between wide limits, the average being about 60 lbs. per c. ft. Pores distinct, being usually filled with a white substance which is in fact the *kathā* or catechin. This substance, as well as the cutch—products of great commercial value,—are obtained by boiling chips of heartwood in earthen pots. The wood is used for rice-pestles, sugarcane- and oilseed-crushers, ploughs, sword-handles and various other purposes. There is, however, a local superstition against the tree, owing to which it is never used in house-building in the School Circle. It yields the best charcoal for blacksmith's work. The astringent bark is sometimes used for tanning.

Fl. May-July. Fr. Nov.-Jan., but remains long on the tree after ripening.

5. ***A. concinna***, DC. ; Fl. Br. Ind. ii. 297 ; Brandis For. Flora 188 ; Gamble Man. Ind. Timb. 150. Vern. *Ālāh*, Hind.

A large climbing shrub, suberect up to about middle age ; stem terete, greyish-brown, with 5 vertical lines of strong conical prickles ; branches grey-canescens. *Leaf-rachises* 4-8 in. long, downy, with a large gland about 5 in. above the base and a smaller one between the uppermost pinnae ; pinnae 3-6 pairs, 2-3·5 in. long ; stipules 25-3 in. long, lanceolate. *Leaflets* acid, 6-20 but generally 10-14 pairs on each pinna with a small odd one near the base, 5-6 by 1-25 in., linear, oblique at the base, quite rounded at the tip, membranous, pale-green above, glaucous beneath ; midrib somewhat diagonal. *Panicles* 3-4 ft. long, interrupted with leaves at the base of the ramifications ; peduncles 1-1·5 in. long, slender, downy, in fascicles of 2-4, lower in the axils of the leaves, upper bracteate ; bracts 15-25 in. long, obliquely obovate-cordate, deciduous. *Heads* 4-5 in. diam., 55-60-flowered, brick-red in



Flowers 2 in. long. *Calyx* deep-crimson, about 1 in. long. *tubular*, deeply 5-toothed; teeth subacute. *Petals* acute, white with a reddish median line, slightly exserted. *Stamens* numerous, much exserted, at first white, withering yellow; filaments very slender. *Pod* 3-4 by 7-1 in., straight, thick, fleshy, 6-10-seeded, slightly indented between the seeds; sutures broad.

Nawáda in the DÚN, and in the Ámláwa valley near Tilwári in JAUNSA; rather rare, but remarkably gregarious where it occurs.

The pods are used for washing the hair, and the acid leaves are eaten.

Fl. Apr., May. Fr. Cold season.

6. **A. Intsia**, Willd.; Fl. Br. Ind. ii. 297; Brandis For. Flora 189; Gamble Man. Ind. Timb. 155. Vern. *Áláy*, Hind.

A large prickly climber, at first with 5 vertical lines of hooked prickles, afterwards deeply 5-fluted along those lines, suberect and bushy in early youth; bark grey. *Leaf-rachises* 5-7 in. long, angled, with a gland near the base, and 0 or 2-3 below the upper pinnæ; pinnæ 6-8 pairs, 2-3 in. long. *Leaflets* 8-12 pairs, 3-5 by 15-2 in., ligulate, dark-green, nearly glabrous and shining above, pale beneath. *Panicles* large, leafless. *Heads* pale-yellow, peduncled, 4-5 in. diam., brown in buds, generally 1-4 together. *Pod* 4-6 by 7-1-2, strap-shaped, dark-brown, finely pubescent, hardly stalked.

Fairly common in the vicinity of the Jumna, both in SAHÁRAN-PUR and the DÚN, e.g., Khárá, Bádsháhibágh, Dákhpathar, etc. Also Khairi swamp, E. DÚN.

The bark is said to be used as a substitute for soap in washing the hair.

Fl. Apr.-Aug. Fr. Dec.-Mar.

A. casia, W. & A.; Major Prain in Journ. As. Soc. Beng. lxvi. Part ii, No. 2., 510, Syn. - *A. Intsia*, var. *casia*, W. & A.; Fl. Br. Ind. ii. 297,—is the form occasionally met with in the DÚN and SAHÁRAN-PUR FORESTS, e.g., at Khairi, Barkálá, Tháno, etc. *Stems* fluted like the above, but always climbing, usually on tall trees. *Pinnæ* and *leaflets* nearly twice as many, the former (and the rachis) pubescent, the latter firm, ciliate, glabrate above, hairy beneath, tip acute. *Pod* somewhat smaller, reddish-brown, glabrous, dehiscent, narrowed to a short stalk.

Fl. Rainy season. Fr. Nov.-Jan.

6. **A. pennata**, Willd.; Fl. Br. Ind. ii. 297; Brandis For. Flora 189; Gamble Man. Ind. Timb. 155. Vern. *Áglá-bel*, *Áglá*, *Áláy*, Dún.



A prickly climber, attaining a larger size than any other climbing *Acacia*; bark reddish-brown, with horizontal cracks. *Leaf-rachises* 6-10 in. long, not angled, downy, with a large brown-coloured gland near the base of the petiole, and several between the upper pinnæ, closely prickly; pinnæ 10-15 pairs, 2-3 in. long. *Leaflets* 80-100 on each pinna, 2-3 by .03-.05 in., firm, quite glabrous, dark-green and shining above. *Panicles* 1.5-2 ft. long; peduncles 1-4 together, .6-.9 in. long, finely downy. *Heads* .5 in. diam. *Flowers* pale, smaller than in the last three species. *Pod* 4-6 by .6-1 in., straight, strap-shaped, reddish-brown, glabrous, 8-12-seeded; stalk .25 in. long; sutures raised.

Very common in the DÚN and SAHÁRANPUR FORESTS, especially in the moister parts, spreading over the tallest trees.

Wood yellowish-white, porous, moderately hard.

Fl. June-Aug. Fr. Nov.-Jan.

3. *Albizzia*, Durazz.; G. P. n. 394.

Unarmed trees. *Leaves* bipinnate; leaflets opposite. *Flowers* 2-sexual, in large globose heads, usually white or rose-coloured. *Calyx* tubular or campanulate, distinctly toothed. *Petal* 4-5, valvate, united below the middle. *Stamens* indefinite, many times the length of the corolla; filaments united at the base, sometimes forming a long sheath. *Ovary* sessile or shortly stalked; style filiform; stigma minute. *Pod* large, thin, flat, strap-shaped, straight, sub-indehiscent; seeds compressed.

Analysis of the Species.

Flower-heads on corymbosely arranged simple peduncles; flowers shortly pedicelled.

Leaflets few, oblong, more than .5 in. broad. . 1. *A. Lebbek*.

Leaflets many, falcate and tapering, scarcely .2 in. broad 4. *A. mollis*.

Flower-heads in panicles; flowers sessile.

Leaflets ovate-oblong, more than .5 in. broad 3. *A. procera*.

Leaflets linear-oblong, about .2-.3 in. broad . 2. *A. odoratissima*.

Leaflets falcate and tapering, scarcely .1 in. broad 5. *A. stipulata*.

1. **A. Lebbek**, Benth. ; Fl. Br. Ind. ii. 298 ; Brandis For. Flora 176 ; Gamble Man. Ind. Timb. 156. Vern. *Siris*, *Sirs*, *Siras* or *Sirsá*, Hind.

A large deciduous tree with a spreading crown ; bark dark-grey, irregularly cracked. *Leaf-rachises* 5-6 in. long, stout, with a large oblong gland near the base, and 1 or more smaller ones between the upper pinnae ; pinnae 2-6 pairs, 4-6 in. long. *Leaflets* 4-9 pairs, 1·3-2 by ·7-1 in., shortly petioluled, oblong, oblique, obtuse, glabrous or glabrescent ; midrib nearly parallel to the upper edge ; lateral nerves not very prominent. *Peduncles* 2-4 in. long, downy, in fascicles of 2-4 from the upper axils, forming short corymbose racemes ; heads many-flowered. *Flowers* greenish-white, shortly pedicelled, fragrant, about 1·5 in. long to the extremities of the stamens. *Calyx* funnel-shaped, 1·5 in. long, short-toothed. *Corolla* twice the length of the calyx ; segments lanceolate. *Filaments* 1-1·5 in. long, rose-tinted, united inside the calyx-tube. *Pod* 8-12 by 1·2-1·7 in., flat, thin, firm, straw-coloured, 6-10-seeded, with brown spots and alternately depressed on either side over the seeds.

Common, though not numerous, in the DŪN and SAHĀRANPUR FORESTS, and also in low valleys in JAUNSAH, generally along banks of streams.

Sapwood large, white ; heartwood dark-brown, mottled and streaked with a darker colour, tough, hard, fairly durable, seasons well, and takes a fine polish ; weight 50-55 lbs. per c. ft. It is used for sugarcane-crushers, oil-mills, well-curbs, wheel-work and furniture. The leaves and twigs are lopped for camel-fodder. The tree is often planted in avenues. It is a rapid grower and can be easily propagated by cuttings.

New leaves Mar., Apr. Fl. Apr., May. Fr. Oct., Nov. but remains long on the tree.

2. **A. odoratissima**, Benth. ; Fl. Br. Ind. ii. 299 ; Brandis For. Flora 175 ; Gamble Man. Ind. Timb. 158. Vern. *Kālī Siris*, Hind.

A fairly large tree having a general dark appearance ; bark dark-grey with patches of darker colour ; extremities grey-tomentose. *Leaf-rachises* 4-7 in. long, downy, with a gland near the base and 1-2 more at the points of insertion of the upper pinnae ; pinnae 3-8 pairs, 3-5 in. long. *Leaflets* 8-20 pairs, generally about 1 by ·2 in., sometimes much broader, linear-oblong, unequal-sided, acute, minutely mucronate, dark-green, glaucous beneath ; midrib parallel to the upper edge and close to it. *Inflorescence* a terminal (rarely axillary) panicle, 10-15 in. long, with corymbose branches on which the peduncles are disposed in fascicles. *Heads* few-flowered ; peduncles 5-8 in. long. *Flowers*, sessile, pale-white, fragrant. *Calyx* about ·04 in. long, hairy. *Corolla*



33. LEGUMINOSÆ-MIMOSÆ.

[*Albizia*.]

silky; segments 1 in. long, lanceolate. *Stamens* about 1 in. long. *Pod* 6-12 by 1-1.2 in., flexible, reddish-brown or dusky-green, 8-12-seeded, with darker spots indicating the position of the seeds.

Occurs sporadically in SAHĀRANPUR and the DŪN. Also in JAUNSAK up to 5,000 ft.

Sapwood rather large, white; heartwood dark-brown with darker streaks, very hard, fairly durable, seasons well, and takes a fine polish; weight 54 lbs. per c. ft. It is used for wheels, oil-mills and furniture. The leaves and twigs are lopped for cattle-fodder.

Scarcely ever quite leafless. New leaves Mar., Apr. Fl. Apr.-June. Fr. Jan., Feb., but remains long on the tree.

A tree much resembling this species but differing from it in having fewer and larger leaflets and smaller panicles was considered, but not described, by Sir D. Brandis as a separate species under the name of *A. Thomsonii*. There are a few fruiting specimens in the School Herbarium from the SAHĀRANPUR SIWALIKS, but none with flowers. The pod does not show any marked difference. Is it *var. mollis*, Benth.?

3. *A. procera*, Benth. ; Fl. Br. Ind. ii. 299 ; Brandis For. Flora 175 ; Gamble Man. Ind. Timb. 158. Vern. Karha, Karhār, Karhāi, Dūn ; Safed Siris or Sirās, Hind.

A very large graceful tree with a deep oval crown when growing in the open; bark yellowish or greenish-white, smooth, peeling off in thin flakes, often with horizontal lines. *Leaf-rachises* 10-15 in. long, glabrous or pubescent, with a large gland near the base; *pinnæ* 3-5 pairs, 6-9 in. long. *Leaflets* 12-24 on each pinna, 1-2 by 6-9 in., shortly petioluled, obliquely oblong-ovate, glabrous; midrib diagonal and nearer the lower edge; lateral nerves rather prominent. *Heads* about 5 in. diam., 15-20-flowered, in fascicles of 2-5, arranged on large lax corymbosely-branched terminal panicles which are 1-2 ft. long; peduncles 5-1 in., the lower from the axils of the upper leaves. *Flowers* yellowish-white, sessile, about 3 in. long. *Calyx* about 1 in. long, tubular, shortly toothed. *Corolla* 1.5 in. long, deeply cleft; segments oblong. *Stamens* a little more than twice the length of the corolla. *Pod* 4-6 by 6-9 in., glabrous, brown, 8-12-seeded, with darker spots over the seeds.

SAHĀRANPUR and the DŪN in mixed forests and generally in moist localities, e.g., Kāluwāla, banks of the Ré nadi, Khairi swamp, etc. Planted in avenues in Dehra.

Sapwood large, of a white colour, not durable. Heartwood light- or dark-brown, straight and even-grained, hard though rather porous, takes a fairly good polish, seasons well and is durable;

weight 46 lbs. per c. ft. "It is largely used for sugarcane-crushers, rice-pounders, wheels, agricultural implements, bridges, and house-posts."—*Sir D. Brandis*. Its charcoal is considered very good. The bark is used for tanning, and is eaten mixed with flour in times of scarcity.

Fl. June-Aug. Fr. Cold season.

4. **A. mollis**, Boivin; Major Prain in Journ. As. Soc. Beng. lxvi, Part ii, No. 2. 514. Syn.—*A. Julibrissin*, Boivin; Fl. Br. Ind. ii. 300; Brandis For. Flora 177; Gamble Man. Ind. Timb. 159. Vern. *Bhondir*, *Kurmurá*, Jaunsar.

A sparingly-branched moderate-sized deciduous tree; bark dark-grey, smooth, with long horizontal wrinkles. *Leaf-rachises* 6-12 in. long, bearing glands at the base and also between the upper pinnae; pinnae 6-12 pairs, 3-5 in. long. *Leaflets* 10-25 pairs, .5-.7 in. long by .15-.2 in. at the base, falcate, acute, very oblique, sensitive; midrib very close, and parallel to, the upper edge, which is quite straight. *Peduncles* 2-3 in. long, fascicled, corymbosely disposed at the axils of the fallen upper leaves. *Flowers* rose-coloured, 1-1.5 in. long, very shortly pedicelled. *Calyx* and *corolla* tubular, pubescent, the former .1 in., the latter .3 in. long and with lanceolate segments. *Filaments* 1 in. long, very slender, rose-coloured. *Pod* 3-5 by .6-.9 in., linear, thin, rather membranous, uniformly pale-brown or yellow, softly tomentose until mature, afterwards glabrous, 8-12-seeded.

JAUNSAR, up to 5,000 ft., usually in open sunny ravines —Dhárágádh, Tons Valley, etc.

Sapwood large; heartwood dark, almost black in old trees, hard, strong, and takes a good polish; weight about 47 lbs. per c. ft. It is used for furniture.

Fl. Apr.-June. Fr. Sept.-Nov., but remaining long on the tree.

5. **A. stipulata**, Boivin; Fl. Br. Ind. ii. 300; Brandis For. Flora 178; Gamble Man. Ind. Timb. 160. Vern. *Siran*, Hind.

A large flat-topped tree of very rapid growth, remarkable for its large semi-cordate acute membranous pubescent *stipules*, whence the specific name; bark grey, with short vertical wrinkles crossed by deeper horizontal furrows. *Leaf-rachises* 7-12 in. long, bearing many glands; pinnae 6-16 pairs, 4-6 in. long. *Leaflets* 20-40 pairs, .3-.5 in. long by about .1 in. at the base, falcate, tapering to a sharp point from a broad base; midrib so close to the straight upper edge as to be hardly distinguishable from it. *Heads* in axillary panicked racemes. *Flowers* yellowish-white, slightly tinged with red. *Calyx* funnel-



shaped, about 1 in. long, short-toothed, pubescent. *Corolla* twice the length of the calyx; segments ovate, pubescent. *Stamens* 1-1.3 in. long, very slender, red-tinged. *Pod* 4-5 by 5-7 in., thin, of a uniform light-brown colour, 8-10-seeded, often rugose over the seeds.

I quite follow Major Prain in thinking that there are two distinct varieties of this species. The type with large stipules is found in JAUNSAR and TEHRI-GARHWAL up to 4,000 ft., e.g., at Thadiár, and the other,—var. *Smithiana*, Roxb.,—with smaller stipules, is what is found near swamps in the DÚN, e.g., Kálímatti, Káluwála, banks of the Ré nadi, Sidharwála, etc. in the DÚN. Vern. *Kaunerá*, Garhwal; *Bhandir*, Hínd.

Sapwood large, white; heartwood reddish-brown; weight varying from 25 to 45 lbs. per c. ft., the typical variety being probably the heavier of the two. The wood is likely to be found suitable for tea-boxes. The tree yields a gum which "is used by the Nepalese for sizing their Daphne paper."—Mr. J. S. Gamble. The branches are lopped for fodder.

New leaves Feb., Mar. Fl. Apr., June. Fr. Autumn.

A. lucida, Benth., Fl. Br. Ind. ii. 299, is a graceful tree with dark-green foliage. It is not indigenous in the SCHOOL CIRCLE, but deserves mention as it grows well under cultivation at DEHRA, and is a good tree for avenues. It differs from all other species by having large penninerved acuminate leaflets, 3-5 in. long and 2-3 in. broad. Flowers sessile. *Pod* about 6 by 1 in., thin, flexible.

ORDER 34. ROSACEÆ ; G. P. n. 53.

Herbs, shrubs, or trees. *Leaves* stipulate, usually alternate, simple or compound. *Flowers* regular, 2-sexual. *Calyx* gamosepalous, superior or inferior. *Disk* annular or lining the base of the calyx-tube. *Petals* usually 5, imbricate. *Stamens* perigynous, usually indefinite, in one or many series, incurved in bud; anthers small. *Ovary* superior or inferior, of one or more free or connate carpels; styles as many as the carpels, free or connate. *Fruit* a pome, a drupe, or an aggregate of drupes achenes or follicles, rarely baccate or capsular. *Seeds* erect or pendulous, without albumen.

Analysis of the Genera.

Ripe carpels not enclosed within the calyx-tube,
i.e., calyx always inferior.

Leaves simple; carpel solitary; fruit a simple
 drupe.

Style terminal; branches unarmed . . . 1. PRUNUS.
 Style basal; branches spinous . . . 2. PRINSEPIA.

Leaves generally simple; carpels few; fruit an
 aggregate of follicles. . . 3. SPIRÆA.

Leaves generally compound; carpels many;
 fruit an aggregate of drupes. . . 4. RUBUS.

Ripe carpels more or less enclosed within the
 calyx-tube *i.e.*, calyx at least ultimately
 superior.

Stipules adnate to the petiole.

(Fruit an aggregate of achenes enclosed in
 a fleshy calyx.) . . . 5. ROSA.

Stipules free, deciduous.

Fruit a pome; leaves simple, rarely pinnate . . 6. PYRUS.

Fruit a drupe with 1-5 bony stones; leaves
 always simple.

Leaves toothed or serrate . . . 7. CRATÆGUS.

Leaves quite entire. . . 8. COTONEASTER.

1. *Prunus*, Linn.; G. P. n. 13.

Shrubs or trees. *Leaves* alternate, simple, usually
 serrate or crenate, convolute or conduplicate in bud;
 petiole often with 2 glands. *Flowers* white or red, soli-
 tary fascicled corymbose or racemed. *Petals* 5.
Stamens many, perigynous, free. *Carpel* 1; style termi-
 nal; ovules 2, pendulous. *Fruit* a drupe, with a smooth
 or rugged 1-seeded stone.

Analysis of the Species.

Flowers long-pedicelled in umbellate fascicles,
 appearing before the leaves. . . 1. *P. Puddum*.

Flowers short-pedicelled in long nodding racemes,
 appearing after the leaves. . . 2. *P. Padus*.

1. *P. Puddum*, "Roxb.; Fl. Br. Ind. ii. 314; Brandis For.
 Flora 194; Gamble Man. Ind. Timb. 163. Vern. *Phájá*, Jaunsar;
Padam, Hind.



34. ROSACEÆ.

[*Prunus*.]

A moderate-sized tree; bark brownish-grey, smooth, peeling off in thin shining horizontal strips. *Leaves* 3-5 by 1-1.5 in., ovate-lanceolate, long-acuminate, closely doubly-serrate, glabrous, shining, conduplicate in bud, appearing after the leaves; petiole about .5 in. long, with 2-4 glands at the base. *Flowers* about .8 in. across, at first rose-coloured, fading to nearly white; peduncles .5-1.5 in., in umbellate fascicles. *Calyx* glabrous; tube .3-.4 in. long, funnel-shaped; lobes acute, entire. *Petals* about .5 in. long, obovate or oblong. *Stigma* 3-lobed. *Fruit* .5-.7 in., ovoid, obtuse at both ends, acid, yellow or red; stone rugose and furrowed.

JAUNSAAR, TEHRI-GARHWAL and the OUTER HIMALAYAS up to 8,000 ft., mostly in the outskirts of villages, apparently cultivated or run wild.—Korwá, Koti-Báwar, Bodyár, Málkôt forest. Also cultivated in DEHRA.

Heartwood reddish, moderately hard, strong, durable, with a pleasant smell; weight 40-45 lbs. per c. ft. The branches with the shining bark on are used for walking-sticks. The fruit is eaten, and the stones strung up in rosaries and necklaces used by faqirs.

New leaves May, June. Fl. Apr.-May, and sometimes also in autumn. Fr. Two months after flowering.

2. **P. Padus**, Linn.; Fl. Br. Ind. ii. 315; Brandis For. Flora 194; Gamble Man. Ind. Timb. 163. The Bird Cherry. Vern. Jámoi, Jámbroi, Jámbnoi, Jaunsar.

A moderate-sized tree; bark rough, dark-grey or brown; young parts and inflorescence softly pubescent. *Leaves* 4-6 by 1-2.5 in., oblong elliptic or lanceolate, acuminate, closely serrate, often slightly cordate, conduplicate in bud, turning red before falling; lateral nerves 12-15 pairs, red and hairy at the axils underneath; midrib and petiole red, stout, the latter 1-1.5 in. long, with a pair of glands near the apex; bud-scales 1.5 by .25 in., reddish-brown. *Flowers* .2-.3 in. diam., white, in many-flowered nodding axillary and terminal racemes which are 4-6 in. long; pedicels .25 in. *Calyx* turbinate, about .1 in. long. *Petals* white, .15 in. long, round, concave. *Drupe* acid, about .4 in. diam., globose, somewhat compressed, red when half ripe, almost black when fully ripe; stone rugged.

Common in JAUNSAAR and TEHRI-GARHWAL, 6,000 ft.—Deoban, Konáin, Bhujkôti, Mundáli, Deotá, etc., characteristic of grazing-grounds. Scarce in the outer ranges.

Wood brownish-white, close and even-grained; weight about 40 lbs. per c. ft. It takes a fine polish, but is seldom used. The acid fruit is eaten by the hill people. The leaves are lopped for fodder.

New leaves Apr. Fl. Apr.-June. Fr. July-Oct.

This Genus belong the following well-known fruit-trees, the cultivation of which is gradually extending in the hills :—

1. *P. persica*, Benth. & Hook. f.; Fl. Br. Ind. ii. 313. The Peach. Vern. *Arú*, Hind. *Leaves* 3-5 by 7-13 in., oblong-lanceolate, serrate. *Flowers* about 1 in. across, pink, sessile. *Fruit* about 1.5 in. long; stone deeply furrowed. Now found in a semi-wild state in most parts of the DÚN. Cultivated throughout the HILLS.

2. *P. armeniaca*, Linn.; Fl. Br. Ind. ii. 313. The Apricot. Vern. *Chilu*, Hills; *Zardálu*, Hind. *Leaves* 2-3.5 in. diam., broad-ovate, acuminate, crenate; petiole 1-1.5 in. long, flexible, glandular. *Flowers* about 8 in. across, white or pinkish. *Fruit* about 1 in. long; stone smooth. Cultivated in the HILLS and also in DEHRA.

3. *P. Cerasus*, Linn.; Fl. Br. Ind. ii. 313.—The Cherry. *Leaves* 2-3 by 1-1.2 in., ovate, elliptic, abruptly acuminate, crenate-serrate. *Flowers* white, on long slender peduncles, in fascicles of 2-5. *Drupe* 4-5 in. diam., globose, smooth and shining; stone round, smooth. Cultivated in the HILLS.

4. *P. communis*, Hudson; var. *insititia*; Fl. Br. Ind. ii. 315. The Plum. Vern. *Álúcha*, *Álú-bukhára*, Hind. *Leaves* 3-4 in. long, ovate-lanceolate, serrate; nerves pubescent beneath. *Flowers* white or pink, on long slender peduncles. *Drupe* smooth, globose or oblong. Cultivated in the HILLS, and some varieties are grown in DEHRA and also in the PLAINS.

2. Prinsepia, Royle; G. P. n. 16.

1. *P. utilis*, Royle; Fl. Br. Ind. ii. 323; Brandis For. Flora 196; Gamble Man. Ind. Timb. 164. Vern. *Bhekoi*, *Bhek*, Jaunsar; *Bhekal*, *Bhekar*, Garhwal.

A dark-green spinous shrub; bark green on branches, brownish-white and peeling off in vertical strips on the main stem; spines often leaf-bearing. *Leaves* alternate, simple, 1.5-5 by 5-1.2 in., elliptic or narrow-lanceolate, acuminate, entire or sharply serrate, coriaceous, dark-green, glabrous; petiole 2-5 in. long. *Flowers* white, 3-4 in. across, in short axillary racemes. *Calyx* cup-shaped, persistent. *Pistils* 5, shortly clawed. *Stamens* numerous, in many series; filaments short; anther-cells separating by a broad connective. *Carpel* 1; style basal; ovules 2, pendulous. *Drupe* 5-7 in. long, obliquely obovate or oblong, with the remains of the style near the base, deep-purple and pruinose when ripe; kernel coriaceous, 1-seeded, smooth; seed oily.



JAUNSAIR 4-8,000 ft.; common in sunny open places. — Saif, Korwá, Matkángará, Konáin, Koti-Báwar, etc.

Heartwood red, very hard, compact, but much liable to split; weight 69 lbs. per c. ft. An oil is expressed from the seeds, which is used chiefly for burning.

Fl. Apr., May. Fr. Rainy season.

3. *Spiræa*, Linn.; G. P. n. 8.

Perennial herbs or shrubs. *Leaves* alternate, simple or compound. *Flowers* white or red, in axillary or terminal cymes. *Calyx* persistent, lobes 4-5. *Petals* as many as the calyx-lobes. *Stamens* many; filaments free or connate below. *Disk* fleshy. *Carpels* 5 or more, free or connate below; ovules 2 or more, pendulous. *Fruit* an aggregate of 5 or more follicular carpels.

Analysis of the Species.

Leaves pinnate; carpels connate below . . . 1. *S. sorbifolia*.
Leaves simple; carpels quite free.

Branches slender; leaves glaucous beneath;
flowers dimorphous. 2. *S. bella*.

Branches stout; leaves pale beneath; flowers
not dimorphous. 3. *S. canescens*.

1. ***S. sorbifolia***, Linn., ; Fl. Br. Ind. ii. 324; Gamble Man. Ind. Timb. 166. Vern. *Latkár*, *Lotkár*, Jaunsar.

A tall shrub, bark reddish-grey. *Leaves* imparipinnate, less frequently paripinnate, 8-12 in. long; rachis terete. *Leaflets* 6-10 pairs, sessile, 3-5 by 7-1 in., linear-lanceolate, rounded at the base, long acuminate, doubly serrate, glabrous or hairy beneath; midrib stout; lateral nerves numerous, straight; stipules linear-subulate, 25 in. long. *Flowers* white, 25 in. diam., in many-flowered cymes which are disposed in large thyrsoid much-branched terminal panicles 1-1.5 ft. long. *Calyx-tube* hemispherical; lobes rounded. *Petals* orbicular. *Carpels* 5, connate below, separating and dehiscing dorsally in fruit.

JAUNSAIR and TEHRI-GARHWAL, 7,9,000 ft.; common at Konáin. Also found at Mundáli, Deotá, etc.

Wood hard, compact, even-grained; weight 49 lbs. per c. ft.

Fl. May, June. Fr. June, July.

2. *S. bella*, Sims ; Fl. Br. Ind. ii. 324.

A small shrub 2-6 ft. high. *Leaves* simple, very variable in size and shape, 5-2 in. long, broadly oblong ovate or ovate-lanceolate, obtusely inciso-serrate throughout or towards the apex only, membranous, dark-green above, glaucous beneath. *Flowers* generally pink, dimorphous and subdioecious, in corymbosely much-branched cymes. *Calyx-tube* villous within; lobes acute. *Petals* orbicular. *Stamens* deformed in the female flowers, long in the male. *Style* long in the female flowers, short in the male. *Ripe carpels* dark-brown, shining.

TEHRI-GARHWAL, e.g., Deotâ, etc.; not very common.

Fl. Apr., May. Fr. Oct., Nov.

3. *S. canescens*, Don ; Fl. Br. Ind. ii. 325 ; Gamble Man. Ind. Timb. 165. Vern. *Tâkoi*, *Chakroi*, Jaunsar.

A stiff small shrub; branches striate, grey-canescent, arching. *Leaves* simple, 4-8 by 3-5 in., obovate, entire or toothed towards the apex on luxuriant shoots, subcoriaceous, pale-green beneath; lateral nerves 2-4 pairs; petiole up to 15 in. *Flowers* hermaphrodite, white or pale-pink, 2 in. diam., in small dense compound corymbs at the ends of all the branches and branchlets. *Stamens* not exceeding the petals. *Ripe carpels* villous, partially sunk in the calyx-tube.

JAUNSAR and TEHRI-GARHWAL, above 7,000 ft., chiefly on open hill-sides. Quite common.

Wood fairly hard, even and close-grained; weight 47 lbs. per c. ft. Light walking-sticks are made of the branches.

Fl. May, July. Fr. Autumn.

S. vacciniifolia, Don ; Fl. Br. Ind. ii. 325 ; occurs in the HILLS below 7,000 ft.—Bâmsu valley, valleys below Konain, Mâlkôt, etc. It is very similar in appearance to *S. bella*, but is more gregarious in habit, and the flowers are hermaphrodite and white.

4. *Rubus*, Linn. ; G. P. n. 36.*The Brambles.*

Usually trailing shrubs, almost always prickly. *Leaves* (in the School Circle) generally compound; stipules more or less adnate to the petiole. *Flowers* white or red, in terminal or axillary corymbose panicles, rarely solitary. *Calyx* 5-lobed, persistent. *Petals* 5. *Stamens* numerous. *Carpels* many, distinct, on a convex receptacle; style subterminal. *Fruit* of many 1-seeded drupes crowded on the receptacle which becomes conical in the fruit.

Analysis of the Species.

- Leaves simple; petals white; fruit black . . . 1. *R. paniculatus*.
- Leaves pinnately 3- rarely 5-foliolate.
- Petals pink; fruit red, generally dry . . . 2. *R. niveus*.
- Petals white; fruit yellow, succulent.
- Leaflets glabrous . . . 3. *R. macilentus*.
- Leaflets tomentose or pubescent beneath.
- Stem bristly; flowers in dense-flowered terminal panicles . . . 4. *R. ellipticus*.
- Stem quite glabrous, pruinose; flowers in 1-3-flowered axillary peduncles. . . 5. *R. biflorus*.
- Leaves pinnately 5-9 foliolate; petals pink; fruit black . . . 6. *R. lasiocarpus*

1. ***R. paniculatus***, Smith; Fl. Br. Ind. ii. 329; Brandis For. Flora 196; Gamble Man. Ind. Timb. 165. Vern. *Pándroi*, *Kálá Anckhu*, Jaunsar.

A large rambling climber; all parts except the upper surface of the leaves clothed with soft white cottony tomentum; prickles few, minute. *Leaves* 3-6 by 2·5-3·5 in., ovate, cordate, long-acuminate, obscurely lobed, irregularly serrate, 3-5-nerved at the base; lateral nerves about 8 pairs; petiole 1-2 in. long. *Flowers* 7-1 in. diam., in much-branched lax terminal panicles which are 4-12 in. long; pedicels 5-1 in. long. *Calyx-lobes* ovate-lanceolate, often caudate-acuminate, erect in fruit. *Petals* 2-3 in. long, much shorter than the calyx-lobes. *Carpels* glabrous. Fruit 5-7 in. long, conical, black; drupes large; receptacle villous.

JAUN SAR and TEHRI-GARHWAL, up to 6,000 ft. Generally in damp shady ravines: Korwá, Dhárágádh, Bagúr Block, Kōti, Tons valley, etc.

The fruit is good to eat.

Fl. Apr., June. Fr. June-July.

2. ***R. niveus***, Wall.; Fl. Br. Ind. ii. 335; Brandis For. Flora 199; Gamble Man. Ind. Timb. 165. Vern. *Bheré*, *Bherá*, *Bheáré*, Jaunsar.

A very variable shrub, rambling or suberect; branches usually glabrous. *Leaves* pinnately 3-foliolate, rarely 5-foliolate, 3-6 in. long; petiole with several prickles beneath. *Leaflets* 1-4 by 8-3 in., ovate or elliptic, often cordate, lobed or incised, generally doubly serrate, membranous. *Flowers* 3-7 in. diam., axillary or in few-flowered corymbose terminal cymes; pedicels 2-8 in. long. *Calyx-segments* 3-4 in. long, ovate-lanceolate, pubescent, spreading or reflexed in fruit. *Petals* pink, 2-3 in. diam., broad-ovate, much smaller than the calyx-lobes, erect, concealing the stamens. *Stamens*



very numerous. *Fruit* globose; drupes many, dry, not edible,—less frequently few, fleshy, very acid.

Gregarious in JAUNSAK and TEHRI-GARHWAL, 7,-10,000 ft.; extremely common.

It interferes with the reproduction of tree species on shady northern aspects as in the Mundáli forest, but in other places is useful as a shade-giver to young plants of delicate species.

Fl. Apr., May. Fr. May, June.

3. **R. macilentus**, Camb.; Fl. Br. Ind. ii. 336; Brandis For. Flora 199.

A trailing shrub, deep-green all over; stem nearly glabrous, shining; prickles flattened. *Leaves* pinnately 3-foliolate; rachis 3-4 in. long. *Leaflets* 5-2.5 in. long, ovate or ovate-lanceolate, doubly crenate-toothed, subcoriaceous, glabrous, prickly along the midrib,—the lateral very variable in size and shape. *Flowers* 3-6 in. across; peduncles 2-8 in. long, pubescent, generally 1-flowered, axillary and terminal. *Calyx-lobes* caudate, erect in fruit, silky outside, tomentose within. *Petals* white, broad-obovate, clawed, exceeding the sepals. *Fruit* globose, yellow or deep-orange; drupes few, glabrous, juicy; receptacle elongated, pubescent.

Common in JAUNSAK and TEHRI-GARHWAL up to 8,000 ft.—Chakrata, Jádi, Konáin, Mundáli, etc.

The fruit is eaten.

Fl. Apr., May. Fr. June, July.

4. **R. ellipticus**, Sm.; Fl. Br. Ind. ii. 336, Syn.—*R. flavus*, Ham.; Brandis For. Flora 197; Gamble Man. Ind. Timb. 166. Vern. *Hĩnsáu*, Jaunsar; *Hĩnsar*, Garhwal; *Ánchhu*, *Lái Ánchhu*. Hind.

A large shrub; branches stout, shaggy with long reddish bristles, often also with glandular hairs; prickles sharp. *Leaves* pinnately 3-foliolate, the lower ones sometimes 1-foliolate; rachis 1-3 in. long. *Leaflets* 2-4 in. long, obovate elliptic or orbicular, closely serrate, dark-green above, pale-green and usually tomentose beneath. *Flowers* 3-6 in. across. *Calyx-segments* ovate, erect in fruit. *Petals* white, obovate, exceeding the calyx-segments. *Fruit* 4-6 in. diam., yellow; drupes small, crowded; receptacle cylindrical, hairy.

JAUNSAK and TEHRI-GARHWAL, 3-5,000 ft.; common on open hill-sides and round villages: Saia, Binálgádh, Dhárágádh, Kōti Báwar, Tons valley, etc. Also OUTER HIMALAYA and the DŪN: Málkōt, Tháno, Ráipur, etc.

The fruit has an agreeable flavour, and is greedily eaten wherever the plant grows.

Fl. Feb., Mar. Fr. Apr., May.



5. **R. biflorus**, Ham.; Fl. Br. Ind. ii. 338. *R. biflorus*, Buch.; Brandis For. Flora 198; Gamble Man. Ind. Timb. 165. Vern. *Achhoi*, Jaunsar.

A large spreading shrub; branches glabrous, white with a glaucous bloom; prickles sharp and strong. *Leaves* usually 3-foliolate, sometimes 5-foliolate, rarely 1-foliolate and 3-lobed; petiole 1-2 in., pubescent, prickly. *Leaflets* 2-3.5 in. long, ovate-lanceolate, often obscurely lobed, irregularly doubly-serrate or toothed, hairy above, white and densely tomentose beneath. *Flowers* 5-7 in. diam.; peduncles axillary, slender, drooping, 5-1.5 in. long, 1-3-flowered. *Calyx-lobes* ovate-lanceolate, mucronate. *Petals* white, orbicular, equal to, or exceeding, the calyx-lobes. *Fruit* 6-7 in. diam., globose, yellow; drupes 20-30, juicy; receptacle elongated, villous.

JAUN SAR, up to 8,000 ft.: Bodyár, Kathián, Dhárágádh. Less common than any of the preceding species.

The fruit has a sweetish taste and is eaten.

Fl. Apr., May. Fr. May, June.

6. **R. lasiocarpus**, Sm.; Fl. Br. Ind. ii. 339; Brandis For. Flora 198; Gamble Man. Ind. Timb. 166. Vern. *Bheré*, *Káik Hinsálu*, Jaunsar; *Káli Áchhi*, Dún.

A spreading shrub, often gregarious; branches long, thickly pruinose, purple below the bloom, quite glabrous. *Leaves* 5-7-9-foliolate, 3-10 in. long. *Leaflets* 1-3 in. long, ovate elliptic or ovate-lanceolate, acutely toothed or serrate, subcoriaceous, glabrous or silky above, thickly white-tomentose beneath, terminal often lobed; lateral nerves close, straight, very strong beneath. *Flowers* 3-7 in. diam., in terminal and axillary simple or paniced lax corymbs; peduncles 1-2 in. long; pedicels of various lengths. *Calyx* densely woolly; lobes ovate or ovate-lanceolate. *Petals* red, round or obovate, usually shorter than the calyx-lobes. *Fruit* 3-5 in. diam., black when fully ripe, dry or fleshy; drupes numerous; receptacle villous.

Fairly common in the DÚN and the OUTER HIMALAYA: Karwá-páni, Rámgarh, Tháno, Málkôt, etc. Also found in JAUN SAR up to 7,000 ft.: Lúrlí forest, Kathián, etc.

The fruit has a good flavour and is eaten.

Fl. Apr., May in the hills; Feb., Mar. in the Dún. Fr. About two months after flowering.

5. **Rosa**, Linn.; G. P. n. 60.

Erect scrambling or climbing shrubs, more or less prickly. *Leaves* alternate, imparipinnate; leaflets serrate; stipules more or less adnate to the petiole. *Inflorescence* various. *Flowers* white yellow or pink.



Calyx-tube globose, ovoid or pitcher-shaped; mouth contracted; segments foliaceous. *Disk* coating the calyx-tube, silky. *Petals* 5, rarely 4. *Stamens* numerous, inserted on the edge of the disk. *Carpels* 1-ovuled, hairy, usually many, enclosed in the calyx-tube; styles free or connate above the neck of the calyx-tube; stigma thickened; ovule pendulous. *Fruit* an aggregate of 1-seeded dry hairy achenes enclosed in the fleshy calyx-tube.

Analysis of the Species.

Suberect shrubs. Styles distinct; sepals persistent in fruit.

Leaflets serrate nearly down to the base;
flowers bracteate; petals 5.

Leaflets toothed only in the upper half;
flowers ebracteate; petals usually 4.

A large climber. Styles united into an exserted column; sepals deciduous in fruit.

1. *R. macrophylla*.

2. *R. sericea*.

3. *R. moschata*.

1. ***R. macrophylla***, Lindl.; Fl. Br. Ind. ii. 366; Brandis For. Flora 203; Gamble Man. Ind. Timb. 167. Vern. *Bhāunrá Kujoi*, Jaunsar.

An erect shrub, 6-10 ft. high, with smooth green branches; bark of stem dark-brown, peeling off in thick flakes; prickles more or less straight, often 0. *Leaves* 3-8 in. long; petiole pubescent, slightly channelled above; stipules 4-6 in. long, spreading, ciliate with glands. *Leaflets* 7-11, 5-2.5 by 3-1.3 in., gradually smaller from the terminal downwards, elliptic, usually grey-pubescent beneath, minutely petioluled. *Flowers* 1-2.5 in. diam., bright-red or pink, solitary or in few-flowered subterminal corymbs; pedicels 5-1.5 in. long, studded with glandular bristles. *Bracts* 1-1.5 in. long, lanceolate, leaf-like, glandular on the margins. *Calyx* with glandular bristles outside; lobes much elongated, filiform in the middle, dilated and leafy above, persistent in fruit. *Petals* 5, broadly obovate. *Styles* hairy, exserted. *Fruit* 1-2 in. long, turbinate.

Common in the HILLS, 7-10,000 ft.; almost gregarious in some forests, e.g., Mohná Block, Mundáli, Konáin, Deotá, etc., where it often interferes with the natural reproduction of tree species.

Wood hard, compact, weighing 55-60 lbs. per c. ft. It makes good hedges. The fruit is eaten.

Fl. May, June. Fr. July, Aug.

Var. *minor*, Lindl.—has leaflets up to 5 in. long and somewhat smaller flowers.



2. **R. sericea**, Lindl.; Fl. Br. Ind. ii. 367; Brandis For. Flora 202; Gamble Man. Ind. Timb. 167.

A suberect thorny shrub, 4-8 ft. high; bark greyish-brown, peeling off in papery flakes; prickles nearly straight, brown. *Leaves* 1-3 in. long; stipules oblong, spreading, membranous. *Leaflets* 7-11, 2.5-1 in. long, oblong or obovate-oblong, dentate or coarsely serrate in the upper half, glabrous above, silky along the nerves beneath. *Flowers* 1.5-2.5 in. diam., solitary, white or pink; peduncle and calyx-tube glabrous; bracts 0. *Calyx-lobes* lanceolate, pubescent, persistent in fruit. *Petals* usually 4, 6-1.2 in. long, obcordate, pure white or with a shade of pink. *Fruit* pyriform, scarlet.

TEHRI-GARHWAL, above 9,000 ft.: Deotá (Rikhsin), Bálcá, Harki-Dún, etc. Likely also to occur at higher elevations in JAUN-SAR.

Fl. May-July.

3. **R. moschata**, Mill.; Fl. Br. Ind. ii. 367; Brandis For. Flora 201; Gamble Man. Ind. Timb. 166. Vern. *Kújo*, Jaunsar; *Kúnjo*, Garhwal.

A large thorny climbing shrub; bark greyish-brown; prickles stout, recurved. *Leaves* 2-6 in. long; petiole pubescent, slightly channelled, with scattered prickles beneath; stipules about 1 in. long, membranous, with a spreading tip and a few glandular hairs along the margins. *Leaflets* 5-9, 1-3 by 4-1.3 in., ovate, ovate-lanceolate or elliptic, acuminate, very regularly closely serrate, finely grey-pubescent beneath, lateral subsessile. *Flowers* sweet-scented, 1.5-2 in. diam., in large terminal corymbs; pedicels 1-1.5 in. long, slender, grey-pubescent and also with a few scattered red glands. *Calyx-lobes* about 1 in. long, narrow-lanceolate, often with 1-2 pairs of foliaceous appendages at the margins, deciduous in fruit. *Petals* 5, pure white, obovate, generally with a distinct tip. *Stamens* yellow, much shorter than the petals. *Styles* exserted, united into a hairy column above the neck of the calyx-tube. *Fruit* 3-4 in. long, obovoid, dark-brown.

Common in JAUN-SAR and TEHRI-GARHWAL, 3,000 to 8,000 ft., also in the OUTER HIMALAYA, generally along streams or in open ravines: Korwá, Konáin, Dhárágádh, Kathián, Tons valley, Ládua-kót, etc.

Often injures forest trees by spreading over their crowns. An excellent otto is extracted from the flowers at Náhan in SIRMOR.

Fl. May, June. Fr. June, July.

6. *Pyrus*, Linn.; G. P. n. 63.

Trees or shrubs. *Leaves* alternate, generally simple, rarely pinnate; stipules deciduous. *Flowers* white or



pink, in terminal corymbs. *Calyx-tube* urceolate or turbinate; lobes erect or reflexed, persistent or deciduous. *Petals* 5. *Stamens* many; filaments sometimes connate at the base. *Carpels* 2-5, adnate to the calyx-tube; ovules usually 2 in each carpel; styles 2-5, free or connate below. *Fruit* a pome, 2-5-celled, more or less fleshy.

Analysis of the Species.

Leaves simple.

Leaves glabrous, green beneath . . . 1. *P. Pashia*.

Leaves always white-woolly beneath . . . 2. *P. lanata*.

Leaves pinnate, (rusty-tomentose beneath) . . . 3. *P. foliolosa*.

1. **P. Pashia**, Ham.; Fl. Br. Ind. ii. 374; Brandis For. Flora 575; Gamble Man. Ind. Timb. 168. Syn.—*P. variolosa*, Wall. Brandis For. Flora 204. Vern. *Káint*, *Káenth*, Jaunsar; *Mohál*, *Mehál*, *Meyel*, *Mahol*; Dún and Garhwal.

A moderate-sized deciduous tree; bark on old stems almost black, both longitudinally and transversely split into small thick rectangular scales, on branches dark-brown smooth and with small white lenticel-dots. *Leaves* simple, very variable in size and shape, generally 2-4 by 7-15 in., ovate or ovate-lanceolate, long-acuminate, generally 2-4 by 7-15 in., ovate or ovate-lanceolate, long-acuminate, closely serrate or crenate, glabrous, shining, lobed and often woolly beneath on young plants; lateral nerves 8-10 pairs, very slender, more prominent above than beneath; petiole 3-15 in. long, slender, often reddish; stipules 5 in. long, setaceous, early deciduous. *Inflorescence* a corymb or an umbel,—or the flowers fasciated at the end of short branches,—appearing shortly before the leaves; pedicels 5-2 in. long, thickened in fruit. *Flowers* white, about 1 in. across. *Calyx-tube* urceolate; lobes spreading, white-woolly. *Petals* obovate, with dark radiating veins. *Stamens* 25-30. *Styles* 3-5, woolly. *Fruit* globose 7-15 in. diam., dark-brown, covered with raised white dots.

Common in JAUNSAAR and TEHRI-GARHWAL up to 7,500 ft.: Chakrata, Koti-Kanásar, Konáin, Dhárágádh, Kathián, etc. Also found in the OUTER HIMALAYA and in certain localities in the DÚN.: Málkôt, Paléd, Tháno, Mothronwála, Bindál-nálá near Dehra, etc.

Wood brown, compact, fine-grained, hard and durable, but liable to split and warp in seasoning; weight 47 lbs. per c. ft. It is used for walking-sticks, combs, tobacco-pipes and such other purposes. The fruit is eaten when half-rotten. The leaves and twigs are lopped for fodder.

New leaves and flowers Mar., Apr. in the hills, and about a month earlier in the Dún. Fr. Sept.-Dec.

2. ***P. lanata***, Don; Fl. Br. Ind. ii. 375; Gamble Man. Ind. Timb. 169. Syn.—*P. Aria*, Ehrh.; Brandis For. Flora 206. Vern. *Pái*, *Páhi*, Jaunsar.

A moderate-sized deciduous tree; bark dark-brown, with shallow longitudinal furrows. *Leaves* simple, 5-8 by 2-4 in., broadly oblong or obovate, acute, lobulate, finely serrate, white-woolly beneath, glabrescent above; lateral nerves 8-12 pairs, nearly straight, very prominent beneath; base rounded or acute; petiole 5-1 in. long. *Flowers* white, 4-6 in. diam., in short hemispherical corymbs, 3-5 in. across; pedicels short, woolly. *Calyx* turbinate; lobes ovate, acute. *Petals* obovate-oblancoolate, shortly clawed. *Stamens* 20. *Styles* 2-3, villous. *Fruit* 5-1 in. long, pyriform and 1-2-seeded (in the School Circle).

JAUNSAR and TEHRI-GARHWAL, above 8,000 ft., characteristic of the high-level grazing grounds. Konáin, Mundáli, Deotá.

Wood close- and even-grained, "might be used for boxes and other purposes."—*Mr. J. S. Gamble*. Weight 40-47 lbs. per c. ft. The fruit is eaten when half-rotten.

Fl. Apr., May. Fr. Aug.-Oct.

3. ***P. foliolosa***, Wall.; Fl. Br. Ind. ii. 376. Syn.—*P. ursina*, Wall.; Brandis For. Flora 206; Gamble Man. Ind. Timb. 169.

A shrub or small tree; bark reddish-grey, peeling off in horizontal papery strips. *Leaves* imparipinnate, 4-6 in. long, rusty-tomentose at first, glabate afterwards. *Leaflets* 9-15 pairs, opposite, sessile, 1-1.5 in. long, the middle ones longer than the others, linear-oblong, acute or obtuse, cuspidate-serrate. *Flowers* greenish-white 3-5 in. diam., in compound terminal and axillary corymbs; pedicels short, glabrous; bracts rusty-hairy. *Calyx* cup-shaped, glabrous; segments triangular. *Petals* orbicular-ovate, rusty-villous. *Styles* thick, short. *Fruit* 3-5 in. diam., ovoid or globose, bluish-red when ripe.

JAUNSAR and TEHRI-GARHWAL, above 7,000 ft.

Fl. June, July. Fr. Sept., Oct.

Two well-known fruit trees belong to this Genus:—

1. ***P. Malus***, Linn.; Fl. Br. Ind. ii. 373. The Apple tree. Vern. *Sew*, Hind. *Leaves* 2-3 in. long, ovate, glabrous above, tomentose beneath, acuminate, crenate, long-petioled. *Flowers* pink-tinged, 1 in. diam. *Calyx-lobes* persistent. *Petals* clawed. *Pome* 2-3 in. diam., globose, intruded at both ends; seeds brown, lenticular. Cultivated at Chakrata. Fl. Mar.-May. Fr. Dec., Jan.

2. *P. communis*, Linn.; Fl. Br. Ind. ii. 374. The Pear tree. Vern. *Nāshpāti*, Hind. *Leaves* variable in size, oblong or ovate, acute, entire or slightly crenulate; petiole slender, very long. *Flowers* white, 1 in. diam. *Calyx-lobes* persistent. *Petals* obovate. *Pome* 1-2 in. diam., pyriform or sub-globose, intruded at the apex. Much cultivated in DEHRA. Fl. Mar., Apr. Fr. July-Sept.

7. *Cratægus*, Linn.; G. P. n. 64.

1. *C. crenulata*, Roxb.; Fl. Br. Ind. ii. 384; Gamble Man. Ind. Timb. 170. Syn.—*C. Pyracantha*, Pers.; Brandis For. Flora 208. Vern. *Gingáru*, Jaunsar.

A large rigid spinescent evergreen shrub. *Leaves* alternate, simple, generally crowded on short lateral branchlets, 1-2.5 by .2-5. in., linear-oblong or oblanceolate, obtuse, very coriaceous, crenulate, glabrous, shining above; lateral nerves close, parallel, indistinct; petiole very short, margined; stipules deciduous. *Flowers* white, .2-3 in. diam., in terminal corymbose cymes; pedicels slender; bracts orbicaducous. *Calyx-tube* hemispherical; lobes obtuse. *Petals* orbicular, very shortly clawed, inserted at the mouth of the calyx-tube. *Stamens* many. *Carpels* 5, connate below; ovules 2 in each cell, ascending. *Fruit* a dry globose drupe, .2-3 in. diam., orange or red when ripe.

JAUNSAR and TEHRÍ-GARHWAL, ascending to 6,500 ft., generally along streams in open valleys: Korwá forest, Binalgádh, Dhárá-gádh, Tons valley, etc. Also along Sub-Himalayan mountain streams in the DŪN, e.g., Bidhálua Ráu and Bindál-nálá.

Wood white, hard, very close and even-grained; weight 48 lbs. per c. ft. The branches are made into walking-sticks and khud-sticks in the hills.

Fl. Apr., May. Fr. July, Aug.

8. *Cotoneaster*, Linn.; G. P. n. 65.

Shrubs or small trees. *Leaves* alternate, simple, entire, usually downy beneath; stipules deciduous. *Flowers* middle-sized, white or pink, solitary or in axillary or terminal corymbose cymes. *Calyx-tube* turbinate; segments 5, short, persistent. *Petals* 5. *Stamens* many, inserted at the mouth of the calyx-tube. *Carpels* 2-5, more or less adnate to the calyx-



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tube, ovules 2 in each cell, erect; styles 2-5, free.
Fruit small, with 2-5 bony 1-seeded stones.

Analysis of the Species.

Erect shrubs; leaves deciduous.

Flowers in many-flowered terminal cymes 1. *C. bacillaris*.

Flowers in few-flowered axillary cymes or

solitary

2. *C. acuminata*.

A prostrate shrub; leaves persistent 3. *C. microphylla*.

1. *C. bacillaris*, Wall.; Fl. Br. Ind. ii. 384; Brandis
 For. Flora 208; Gamble Man. Ind. Timb. 171. Vern. *Ráunsh*, *Ruinsh*,
Leonsh, Jaunsar.

A very variable shrub, usually 10-18 ft. high, but under favourable circumstances a small tree attaining a considerable girth (e.g., 9 ft. 6 in. at Bálchá)*; crown spreading; bark bluish-grey, almost smooth, marked with short transverse white bars. *Leaves* 1-3.5 by .7-1.7 in., ovate ovate-oblong, obovate or lanceolate, rather membranous, finely pubescent or glabrescent and pale beneath, often minutely mucronate; midrib very prominent beneath, depressed above; main lateral nerves 6-10 pairs; base acute; petiole .2-.4 in.; stipules .2-.3 in. long, subulate, early caducous. *Flowers* white, .25-.3 in. across, in spreading compound cymes at the end of short leaf-bearing branchlets; pedicels minute or 0. *Fruit* .2-.25 in. diam., globose, 2-celled, in spreading bunches, dark-brown when ripe.

JAUNSAAR and TEHRI-GARHWAL, 48,500 ft.: Deothát, Bodyár, Konáin, Mundáli, Deotá, Lambátách, Bálchá, etc. Generally in open ravines and on grassy hill-sides.

Wood brownish-white, very hard, tough, close and even-grained; annual rings distinct; weight 57 lbs. per c. ft. The branches are much sought after for making walking-sticks; indeed no tree of any size is ever found which has not been repeatedly mutilated.

C. rosea, Edgew. is relegated under var. *affinis* of the above species in the Fl. Br. Ind. It is a much smaller shrub, and the smaller pink flowers open later. Found by Mr. Duthie near the Deotá temple, TEHRI-GARHWAL, and by myself at Bájámára, JAUNSAAR.

Fl. Apr.-June. Fr. June, July.

2. *C. acuminata*, Lindl.; Fl. Br. Ind. ii. 385; Brandis
 For. Flora 209; Gamble Man. Ind. Timb. 171. Vern. *Leonshi*,
Ráunshi, *Ruinshi*, Jaunsar.

A shrub smaller than the last, never with a spreading crown; bark dark bluish-grey, shining. *Leaves* 1-2.5 by .4-.8 in., ovate-lanceolate or elliptic, acuminate, silky-pubescent beneath; margins

* Measured 3rd June 1900.

usually ciliate with silky hairs. *Flowers* white, '3-4 in. diam. solitary or in few flowered axillary and subterminal cymes. *Calyx* turbinate, reddish-brown inside. *Fruit* '3 in. long, turbinate, red when ripe.

JAUNSAAR, 8,10,000 ft.; common at Deoban, less so at Konáin and Mundáli.

Wood as of the last species. The branches are made into walking-sticks, but pieces of sufficient thickness are rather rare.

Fl. May, June. Fr. June, July.

3. *C. microphylla*, Wall.; Fl. Br. Ind. ii. 387; Brandis For. Flora 209; Gamble Man. Ind. Timb. 171. Vern. *Bheddá*, Jaunsar.

A small much-branched prostrate evergreen shrub; bark dark-grey, almost black. *Leaves* '3-5 by '2-35 in., ovate obovate or elliptic, acute obtuse or retuse, coriaceous, dark-green and glossy above, pubescent or pilose beneath, minutely petioled; margins recurved, more or less ciliate when young. *Flowers* white, '4-5 in. diam., axillary, solitary. *Fruit* '3-4 in. long, globose or obovoid, finely pubescent, scarlet when ripe.

Common in JAUNSAAR and TEHRI-GARHWAL, between 6,500 and 10,000 ft., trailing on rocks or spreading on grassy hill-sides. The branches are used in Kashmir for making baskets. The ripe fruit is sweet.

Fl. Apr.-June. Fr. July, Aug.

Very similar in appearance are *C. thymifolia*, Hort., and *C. buxifolia*, Wall., Fl. Br. Ind. ii. 387, differing chiefly in the flowers, being generally cymose. Both are likely to occur in the same localities, especially in the inner ranges.

Mr. Gamble thinks that *C. multiflora*, Bunge, and *C. nummularia*, Fisch., Fl. Br. Ind. ii. 386, also occur above 10,000 ft. These are bushy plants generally with small leaves. The former is somewhat larger than the other, and has, as the specific name implies, more-flowered cymes. The latter has orbicular leaves, whence its specific name.

Potentilla fruticosa, Linn., Fl. Br. Ind. ii. 347,—is a low undershrub found near Pandáwa in JAUNSAAR and at Rikhshin and Moriru in TEHRI-GARHWAL. *Leaves* usually 3-foliolate; leaflets '4-7 in. long, lanceolate. *Flowers* solitary, diœcious. *Fruit* of hairy achenes.—G. P. n. 48.

The Loquat, *Eriobotrya japonica*, Lindl., Fl. Br. Ind. ii. 372; Vern. *Lokát*, *Lukát*, Hind.,—is another well-known fruit tree of this Family. *Leaves* subsessile, 6-10 in. long, oblanceolate, acuminate, distantly serrate, hard, coriaceous, densely woolly and strongly nerved



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beneath. *Flowers* dull-white, fragrant, in terminal panicles. *Fruit* pyriform or globose, baccate, 1.5-2 in. long, yellow or orange when ripe; seeds 2-5, dark-brown, smooth. Much cultivated at DEHRA and SAHARANPUR. Fl. Nov, Dec. Fr. Mar., Apr.—G. P. n. 66.

ORDER 35. SAXIFRAGEÆ; G. P. N. 59.

Herbs, less frequently shrubs or trees. *Leaves* opposite or alternate, simple, usually exstipulate. *Flowers* regular, generally 2-sexual. *Calyx* more or less adnate to the ovary, rarely quite free. *Petals* 5, sometimes 4, rarely 0. *Stamens* free, as many as the petals or twice their number, rarely numerous. *Disk* annular or glandular. *Ovary* of 2 or 3-5 carpels and as many cells, rarely 1-celled; styles as many as the carpels, free or united; ovules many; placentation axile, parietal in 1-celled ovaries. *Fruit* a berry or capsule, or composed of follicles.

Analysis of the Genera.

Leaves opposite; stamens not fewer than 8.

Stamens 8 or 10.

Flowers polygamous; stamens linear . . . 1. HYDRANGÆA.

Flowers 2-sexual; stamens winged . . . 2. DEUTZIA.

Stamens 20-40 . . . 3. PHILADELPHUS.

Leaves alternate; stamens not more than 5.

Ovary almost wholly superior; fruit a capsule . . . 4. ITEA.

Ovary wholly inferior; fruit a berry . . . 5. RIBES.

1. Hydrangæa, Linn.; G. P. n. 22.

1. *H. altissima*, Wall.; Fl. Br. Ind. ii. 404; Brandis For. Flora 211; Gamble Man. Ind. Timb. 172. Vern. *Kathmorá*, Garhwal.

A large climbing shrub; bark cinnamon-colour, shining, membranous, loose, peeling off in long papery rolls. *Leaves* 3-6 in. long, ovate or ovate-lanceolate, acuminate, sometimes cordate, entire or more or less dentate, membranous; main lateral nerves 6-8 pairs; petiole 1-2 in. long. *Flowers* cream-colour, polygamous, very small if fertile, enlarged to about 1 in. diam. and apetalous if sterile. *Calyx-tube* adnate to the ovary; limb 4-5-fid; segments of sterile flowers 2.5 in. long, spreading. *Petals* (if present) 4-5, valvate, falling off in a cap. *Stamens* 10; filaments filiform. *Ovary* inferior; styles 2-4. *Fruit* a membranous capsule.



Very common in JAUNSAK and TEHRI-GARHWAL, 5,900 ft., usually associated with the last, but sometimes also found on sunny hill-sides which that species avoids.

Wood similar to that of *D. corymbosa*, but somewhat lighter.

Fl. Apr.-June.

3. *Philadelphus*, Linn.; G. P. n. 29.

1. ***P. coronarius***, Linn.; Fl. Br. Ind. ii. 407; Brandis For. Flora 212; Gamble Man. Ind. Timb. 173.

A shrub with light-grey bark, somewhat resembling *Deutzia corymbosa*. *Leaves* opposite, 1·5-4 by 7·2·5 in., ovate-lanceolate, long-acuminate, finely hairy and rather glossy beneath; lateral nerves 3 pairs, sub-basal, prominent beneath, very arcuate; petiole 25·5 in. long. *Flowers* white, 6·8 in. diam., solitary or in few-flowered axillary cymes, pedicels 3·5 in. long. *Calyx-tube* adnate to the ovary; lobes 4, rarely 5, valvate, pubescent within. *Petals* 4, rarely 5, convolute in bud, 3·5 in. long. *Stamens* 20-40; filaments subulate. *Ovary* inferior, 3-5-celled; styles 3-5, more or less combined at the base. *Fruit* a capsule, 5 in. long, 3-5-celled, turbinate or obovoid, subtruncate, dehiscing loculicidally.

Common in TEHRI-GARHWAL beyond the Tons, above 6,000 ft.: Lambátách, Deotá. Rather scarce in JAUNSAK: Konáin.

Wood soft, white, with a large pith; weight 44 lbs. per c. ft.

Fl. May-July.

4. *Itea*, Linn.; G. P. n. 47.

1. ***I. nutans***, Royle; Fl. Br. Ind. ii. 408; Brandis For. Flora 213; Gamble Man. Ind. Timb. 171.

A small tree with dark-grey bark. *Leaves* alternate, 4-6 by 1·5-2·5 in., ovate- or elliptic-oblong, acuminate, glandular-serrate or denticulate, subcoriaceous, glabrous, dark-green and shining above; lateral nerves 5-7 pairs, joined by distinct intramarginal veins. *Flowers* white, small, in fascicles of 2-5, in simple terminal and axillary racemes which are much longer than the leaves. *Calyx* adnate to the ovary; teeth 5, erect, persistent. *Petals* 5, valvate, erect. *Stamens* 5. *Ovary* oblong, 2-celled; style simple, furrowed, persistent. *Capsule* 2 in. long, septicidally 2-valved.

OUTER HIMALAYA and the DŪN: above Rájpur; banks of the Ré-nadi near Lachiwála and at Nakraunda (1,800 ft.).

Wood brownish-white, moderately hard.

Fl. Apr.-July. Fr. Oct., Nov.

5. *Ribes*, Linn.; G. P. n. 71.

Usually unarmed shrubs. *Leaves* alternate, generally palmately lobed. *Flowers* middle-sized, often 1-sexual, racemed or solitary; pedicels bracteate. *Calyx* superior; tube as long as, or longer than, the ovary. *Petals* 4-5, epigynous, white yellow red or dark-purple. *Stamens* 4-5, epigynous. *Ovary* inferior, 1-celled; ovules numerous, on 2 perietal placentas; styles 2, free or connate. *Fruit* an oblong or globose berry.

Analysis of the Species.

- Racemes erect in flower; calyx-tube hardly exceeding the fruit 1. *R. glaciale*.
Racemes drooping; calyx-tube produced above the fruit. 2. *R. rubrum*.

1. *R. glaciale*, Wall.; Fl. Br. Ind. ii. 410; Brandis For. Flora 14; Gamble Man. Ind. Timb. 173.

A shrub, 5-8 ft. high, with shining brown stems; cuticle peeling off in long strips or rolls. *Leaves* 1-2.5 in. long, cordate, 3-5-lobed, with the middle lobe often elongated, or not lobed and ovate, 3-5-nerved at the base, with 2-4 pairs of lateral nerves in the middle lobe, glabrous or pubescent along the nerves beneath, sometimes with scattered hairs above; margins crenate-serrate. *Flowers* about .25 in. diam., greenish (drying brownish or pink), in pubescent racemes 2-3 in. long which are erect in flower but drooping in fruit; bract much longer than the pedicels. *Berries* acid, .25 in. long, globose, smooth, glabrous or minutely pubescent.

TEHRI-GARHWAL, above 9,000 ft.: Rikhshin. Rare, if it occurs at all, in JAUNSAAR.

Fl. May. Fr. July.

2. *R. rubrum*, Linn.; Fl. Br. Ind. ii. 411; Brandis For. Flora 215; Gamble Man. Ind. Timb. 173. The Red Currant. Vern. *Karan*, Jaunsar, probably from *currant*.

A shrub, 6-10 ft. high, with dark-brown shining stems marked with horizontal lenticel-bars; cuticle peeling off in long strips or rolls; young shoots red, glabrate. *Leaves* (very much like those of *Acer casium*), 3-5 in. diam., as broad as long or broader, cordate, 3-5-lobed, crenate-serrate, 3-5-nerved at the base, membranous, glabrescent, somewhat shining beneath; lateral nerves 3-5 pairs on the 3 larger lobes



35. SAXIFRAGÆ.

CSL
[Notes.]

depressed above, very prominent beneath; petiole red, 3-4 in. long, flattened and with a few scattered grey hairs along the margin near the base. *Ricemes* 4-6 in. long, pubescent, many-flowered, from the nodes of last year's shoots with a few small leaves near the base; bracts not exceeding the pedicels. *Flowers* greenish-yellow, 3-4 in. diam; pedicels about 1 in. long. *Berries* 3-4 in. long, globose, smooth, red.

Common in JAUNSAE and TEHRI-GARHWAL, above 7,500 ft. —Deoban to Mundali, also at Deotā.

Fl. Apr., May. Fr. May, June.

Saxifraga ligulata, Wall., Fl. Br. Ind. ii. 398. The Wax-Flower. Vern. *Shilphāra* (the rock-splitter, which curiously corresponds to the meaning of the generic name), *Dhonk-phulātē*, Jaunsar,—is an herbaceous plant common and conspicuous enough to deserve mention. *Leaves* 3-5 in. diam., suborbicular, fleshy, glabrous, strongly ciliate, often pinkish beneath. *Flowers* pinkish-white, waxy, 6-8 in. diam. *Petals* clawed. *Carpels* and *styles* 3, the latter very long. Fl. Apr., May.—G. P. n. 6.

ORDER 36. RHIZOPHOREÆ; G. P. N. 65.

Trees or shrubs. *Leaves* opposite, entire, coriaceous, generally glabrous; stipules interpetiolar, early caducous. *Flowers* regular, axillary, usually bisexual. *Calyx* more or less adnate to the ovary or free, 4-14-toothed or -lobed, persistent. *Petals* as many as the calyx-lobes. *Stamens* 2-4 times the number of petals; filaments free. *Ovary* 5-1-celled by the absence of the septa; styles usually connate; ovules pendulous. *Fruit* 1-seeded, 1-celled, coriaceous, indehiscent.

1: *Carallia*, Roxb.; G. P. n. 5.

1. *C. integerrima*, DC.; Fl. Br. Ind. ii. 439; Brandis For. Flora 219; Gamble Man. Ind. Timb. 177.

An evergreen tree; bark dark-grey and smooth on old stems, lighter-grey and corky on young poles, often developing bunches of fleshy adventitious roots on the trunk. *Leaves* 3-5 by 1-5-3 in. elliptic-obovate, entire or serrulate near the apex, coriaceous, glabrous, shining; margins usually recurved; main lateral nerves 8-10 pairs, indistinct until dry; petiole 2-4 in. long, stout, margined. *Flowers* sessile, 6-8-merous, 2 in. across, in short axillary trichotomous

cymes, peduncles and pedicels stout. *Calyx-lobes* 5-8, erect, valvate. *Petals* 5-8, white, orbicular, serrate at the apex. *Stamens* twice as many as the petals; filaments filiform. *Fruit* about 2 in. across, globose, 1-celled, 1-seeded.

Only a few trees have been found in the Nakraunda swamp and along the banks of the Ré-nadi near Lachiwála, 1,800 ft; also on the Táwá nála near Khairi, 1,200 ft.

The heartwood is red, hard and durable, and works and polishes well. It has a very pretty silver-grain resembling that of oaks. "It is used in South Kanara for furniture and cabinet-making, and in Burma for planking, furniture and rice-pounders."—*Mr. J. S. Gamble*. The leaves are lopped for cattle-fodder.

Fl. Dec.-Apr.

ORDER 37. COMBRETACEÆ; G. P. n. 66.

Trees or shrubs. Leaves usually simple, petiolate, entire, opposite or alternate, exstipulate. *Flowers* bracteate, usually bisexual. *Calyx-tube* adnate to the ovary; lobes 4-5, valvate. *Petals* 4-5, or none. *Stamens* 4-5, or twice as many, inserted on the calyx. *Ovary* inferior, 1-celled; style simple; ovules 1-7, pendulous from the apex of the cell. *Fruit* usually a coriaceous drupe, 1-celled, 1-seeded, winged or angular; seed exalbuminous; cotyledons convolute or plano-convex, often fleshy and oily.

Analysis of the Genera.

Flowers in spikes or racemes.

Large trees with alternate or sub-opposite leaves;

petals none 1. TERMINALIA.

Climbing shrubs with opposite leaves; petals

generally present 3. COMBRETUM.

Flowers in heads; leaves alternate or inconstantly

opposite; petals none 2. ANOGEISSUS.

1. Terminalia, Linn.; G. P. n. 1.

Large trees. *Leaves* alternate or sub-opposite, entire or slightly crenulate, exstipulate, often with glands on the petiole. *Flowers* small, sessile, usually bisexual, bracts



deciduous. *Calyx-tube* produced over the ovary with a constricted mouth; lobes 4-5, valvate. *Petals* 0. *Stamens* 8-10, inserted on the calyx-tube in two rows. *Ovary* 1-celled; ovules 2-3, pendulous. *Fruit* oblong, ovoid, ellipsoidal or globose, winged or angular, with a coriaceous or bony kernel; cotyledons convolute.

Analysis of the Species.

Fruit fleshy, not winged.

Petiole long; fruit velvety, not ribbed . . . 1. *T. belerica*.

Petiole short; fruit glabrous, more or less ribbed . . . 2. *T. Chebula*.

Fruit coriaceous, with 5 broad wings . . . 3. *T. tomentosa*.

1. ***T. belerica***, Roxb.; Fl. Br. Ind. ii. 445; Brandis For. Flora 222; Gamble Man. Ind. Timb. 179. Vern. *Baherá*, Hind.

A large deciduous tree with bluish- or ashy-grey bark uneven with longitudinal furrows. *Leaves* alternate, crowded towards the ends of the branches, 3-8 in. long, obovate, elliptic, coriaceous, pale beneath, subacute or acuminate; lateral nerves 5-8 on either side of the thick midrib; base often unequal; petiole 1-3 in., usually glandular. *Spikes* 3-6 in. long, simple, slender, interrupted. *Flowers* about 2 in. across, pale-white or greenish-yellow, with an offensive smell, the upper often male; bracts early caducous. *Calyx-lobes* triangular, woolly inside. *Ovary* tomentose. *Fruit* 1 in. long, ovoid ellipsoidal or globose, grey-velvety; nut thick and hard.

It is a constant companion of *Sál* and is found almost everywhere in the *DÚN* and *SAHÁRANPUR* FORESTS; also in *JAUNSA*R in the *Ámláwa* and *Tons* valleys.

It grows to a height of 80-100 ft. with a girth of 8-10 ft., and is easily recognized from a distance by its characteristic bark and broad massive crown. The wood is light-grey or yellowish, hard and coarse-grained, not durable; heartwood and annual rings not distinct; weight about 50 lbs. per c. ft. It is used for various purposes, from house-building to packing-cases, and sells readily in the *School Circle*. The fruit is very valuable, being one of the *myrobolans* of commerce. "It is a favourite food of monkeys, deer, sheep, goat and cattle,"—*Sir D. Brandis*, and is used in dyeing and making native ink. The kernel is edible, and gives an oil which is used for the hair.

Fl. Apr.-June after the new leaves. Fr. Dec.-Feb.

2. ***T. Chebula***, Retz.; Hook. Fl. Br. Ind. ii. 446; Brandis For. Flora 223; Gamble Man. Ind. Timb. 180. Vern. *Har*, *Harr*, *Hark*, or *Harark*, Hind.

A large deciduous tree with dark-brown bark; young parts covered with rusty hairs. *Leaves* mostly sub-opposite, 3-6 in. long, ovate or oblong-ovate, acuminate; lateral nerves arcuate, prominent, 6-12 on either side of the midrib; base acute or rounded; petiole hardly exceeding 1 inch, often with 2 or more glands on the upper side. *Flowers* about 1 in. across, all bisexual, sessile, dull-white, in paniced or clustered usually-terminal spikes; bracts subulate. *Calyx-lobes* acutely triangular, covered inside with brown hairs; limb cup-shaped. *Stamens* 8-10; filaments long, spreading. *Fruit* 1-2 in. long, obovoid, ellipsoidal or ovoid, more or less distinctly ribbed; nut hard, with a rough grooved surface.

Found in the same localities as the last, but is generally less common in the SCHOOL CIRCLE. It is, however, fairly common in certain limited areas, e.g., along the Lambi Râu, Tháo; and south of the Sample area, Lachiwála; forests near Timli, etc.

In the School Circle it is a smaller tree than the last. The heartwood is pale or dark-brown with a greenish tinge, finely mottled, hard, close-grained, fairly durable, and is used for house-building, agricultural implements and furniture; weight about 60 lbs. per c. ft. The bark, the galls formed on young twigs, and the fruit are used for tanning and dyeing. Indeed the last is the most important part of the tree, being the black myrobolan of commerce and is largely exported to Europe from Bombay. The unripe fruit is a favourite drug in Hindu medical practice.

New leaves in April. Fl. Apr.-June. Fr. Jan.-Mar.

3. ***T. tomentosa***, W. & A.; Fl. Br. Ind. ii. 447; Brandis For. Flora 225; Gamble Man. Ind. Timb. 182. Vern. *Sáin*, Dún and Saháranpur; *Asainá*, Hind.

A large deciduous tree; bark dark-grey or black, much furrowed, exfoliating in thick rectangular plates; inner bark reddish-brown; young parts rusty-pubescent. *Leaves* alternate or sub-opposite, 5-9 by 2.5-4 in., oblong, elliptic or obovate, coriaceous, glabrescent above, tomentose beneath; lateral nerves 10-20 pairs, parallel, slightly arcuate; base often unequal sided, acute or rounded; petiole 3-4 in., often with a gland or two on the sides. *Flowers* bisexual, dull-yellow, 1-1.5 in. across, sessile, in large erect paniced spikes. *Calyx-lobes* ovate, broad-acute, often hairy; free part of the tube salver-shaped. *Fruit* 1.5-2.5 in. long, with 5 broad transversely-striated coriaceous wings with a crenulate edge.

Associated with *Sál* in the Dún, and in the hill forests of the SAHÁRANPUR DIVISION, especially in clayey localities; also found in the OUTER HIMALAYAN VALLEYS, up to 4,000 ft.



It grows to a height of 80-100 ft. with a girth of 8-10 ft. Sapwood reddish or yellowish-white; heartwood dark-brown, with darker streaks, very hard, seasons well, but is liable to split. It is used for house-building, agricultural implements and such other purposes. It is also an excellent fuel and gives very good charcoal. The bark is much used for tanning and sometimes also for dyeing. The "tassar" silkworm is fed on the leaves in the Central Provinces. Sain coppices and pollards well, and is a good nurse for young Sál in frosty localities. The ovary is sometimes attacked by a gall-insect which prevents the fruit being formed.

New leaves May, June. Fl. June-Aug., and sometimes a second flush in the cold season (Dec. 1893 in the Dún). Fr. Feb.-Apr.

T. Arjuna, Bedd.; Fl. Br. Ind. ii. 447., Vern. *Arjún*, Hind.;— is a tree closely resembling the last species in foliage and inflorescence, but differs in having smooth grey bark and smaller 5-7-winged fruit. It is an excellent avenue tree and has been planted as such near Fatehpur on the Saháranpur-Chakrata road, and (but looking almost like self-sown) on the Dehra-Hardwar and Hardwar-Rikhikesh roads not far from Pardúni. The wood is used for much the same purposes as that of Sain.

Fl. Apr., May. Fr. Cold season.

2. *Anogeissus*, Wall.; G. P. n. 5.

1. *A. latifolia*, Wall.; Fl. Br. Ind. ii. 450; Brandis For. Flora 227; Gamble Man. Ind. Timb. 185. Vern. *Bákli*, *Bánkli*, Hind.

A tall tree with smooth greenish-white bark. Leaves alternate or inconstantly opposite, 2-4 by 1-2.5 in., elliptic, ovate or ovate-lanceolate, acute, obtuse or emarginate, subcoriaceous, glabrescent; petiole 3-5 in. long. Flowers small, in globose heads; heads about 5 in. diam., in short axillary racemes. Calyx-tube compressed, laterally 2-winged, long and narrowed above the ovary. Petals 0. Stamens 10, in two series. Ovary 1-celled; ovules 2, pendulous. Fruit a dry drupe 3 by 2 in., compressed, narrowly 2-winged, imbricately arranged in the head, crowned with the remains of the calyx-tube which is now modified into a beak.

Common in the DÚN and SAHÁRANPUR FORESTS and on the OUTER HIMALAYAN slopes ascending to 4,000 ft.; sometimes gregarious in small patches on alluvial banks of streams.

Wood grey, close and even-grained, compact, hard, very tough and lastic, but splits in seasoning, and is not durable unless kept dry; weight 55-70 lbs. per c. ft. It is used extensively for construction, furniture, agricultural implements, house-posts, poles for carrying loads and such other purposes requiring toughness and elasticity.

Fl. May, June. Fr. Cold season.



3. Combretum, Linn.; G. P. n. 10.

1. **C. decandrum**, Roxb.; Fl. Br. Ind. ii. 452; Brandis For. Flora 221; Gamble Man. Ind. Timb. 179. Vern. *Ruel* or *Roel*, Dún.

A large climbing shrub; young parts covered with silky pubescence. *Leaves* opposite, 4-5 by 1·5-2·3 in., elliptic-oblong, acuminate, glabrous, the floral ones or bracts 2-2·5 in. long, dull-white, villous; lateral nerves 6-8 on either side of the midrib, arcuate; petiole 2-4 in. long. *Flowers* greenish-white, about 1·5 in. long, numerous, in dense villous cylindrical racemes about 1 in. long, which are arranged in large terminal panicles. *Calyx* hairy; lobes 5, valvate, deciduous. *Petals* 5, small, oblong, glabrous, inserted between the calyx-lobes. *Stamens* 10, in two series. *Ovary* 1-celled; ovules 2-5, pendulous. *Fruit* 1 in. long, oblong or elliptic, with 4-5 smooth papery wings.

Very common in the WESTERN DÚN, especially from Ámbáris to Kálsi. All the hill-side round the latter town is clothed in white when it flowers with its characteristic petaloid bracts.

Fl. Feb., Mar. Fr. May, June.

C. nanum, Ham.; Fl. Br. Ind. ii. 457;—is a small decumbent undershrub found in grass lands near Maindrot in the Tons valley, TEHRI-GARHWAL and also occasionally in similar localities in the DÚN. *Leaves* opposite, 2-4 by 1·5-3·5 in., ovate or obovate, glabrous. *Flowers* in terminal and axillary racemes. *Fruit* 1·5 by 1 in., coriaceous, light, with 4-5 papery wings. It grows annually from a perennial rootstock down to which it is burnt by forest fires.

Quisqualis indica, Linn.; Fl. Br. Ind. ii. 459, the Rangoon creeper,—is a climbing shrub cultivated in gardens in SAHÁRANPUR and the DÚN. *Leaves* opposite, about 4 in. long, obovate, acuminate, entire. *Calyx-tube* prolonged about 2 in. above the ovary; limb 5-fid. *Petals* red, oblong or round. *Fruit* about 1 in. long, sharply 5-angled, glabrous, black.—G. P. n. 12.

ORDER 38. MYRTACEÆ; G. P. N. 67.

Trees or shrubs, rarely herbs. *Leaves* opposite, seldom alternate, simple, usually entire, exstipulate, mostly coriaceous, generally bisexual, solitary or in heads, cymes or corymbs. *Calyx-tube* adnate to the ovary; limb 4-5-cleft, or entire, deciduous or persistent. *Disk* coating the calyx-tube. *Petals* inserted

on the disk, as many as the calyx-lobes and alternating with them, rarely absent. *Stamens* usually indefinite, inserted with the petals in several rows; filaments free, or connate at the base forming bundles or a short tube. *Ovary* syncarpus, inferior or half-inferior, 1-celled, 1-ovuled, or 2-many-celled with indefinite ovules on axile placentas. *Fruit* dehiscent or indehiscent, crowned with the remains of the calyx-limb; seeds compressed or angular.

Analysis of the Genera.

- | | |
|---|-------------|
| Leaves opposite, entire, gland-dotted | 1. EUGENIA. |
| Leaves alternate, crenate-serrate, not gland-dotted | 2. CAREYA. |

1. *Eugenia*, Linn.; G. P. n. 58.

Evergreen trees or shrubs. *Leaves* opposite, entire, penninerved. *Flowers* usually tetramerous, in lateral or terminal trichotomous cymes or panicles. *Bracts* small, deciduous. *Calyx-tube* globose or more or less elongate; lobes usually 4. *Petals* generally 4, free or united in a calyptra. *Stamens* indefinite, in several series, free or slightly combined into four bundles; anthers versatile. *Ovary* usually 2-celled, with several ovules in each cell. *Fruit* a drupe-like berry, crowned with the remains of the calyx-limb; seeds variously compressed.

Analysis of the Species.

- | | |
|---|---------------------------|
| Leaves subcoriaceous, soft, lateral nerves distant | 1. <i>E. operculata</i> . |
| Leaves coriaceous, tough, lateral nerves very close | 2. <i>E. Jambolana</i> . |

1. *E. operculata*, Roxb.; Fl. Br. Ind. ii. 498; Brandis For. Flora 234; Gamble Man. Ind. Timb. 194. Vern. *Piāman*, *Thūti*, Dūn.

A moderate-sized evergreen tree; bark rough with irregular hard scales. *Leaves* 3-6 by 2-3.5 in., broad-ovate or elliptic, rounded at the apex or obtusely acuminate, very variable in shape and size, subcoriaceous, soft, turning red in the cold season; lateral nerves 8-12

pairs, prominent beneath, gradually fainter towards the margin; petiole 7-1 in. long. *Flowers* tetramerous, small, greenish, sub-sessile, in 3-flowered cymes arranged in trichotomous lateral panicles below the current year's leaves. *Calyx* campanulate, with short obtuse lobes. *Petals* united and falling off in one piece (*operculum*). *Berry* globose or ovoid, 3-5 in. across, juicy.

Common in the DŪN and SAHĀRANPUR FORESTS, especially in blanks inside Sāl areas, where it is often the first tree to appear, under whose shelter seedlings of superior species have a better chance against frost and excessive heat.

Heartwood not distinct. Wood brown or reddish-grey, hard, close and fine-grained; weight 45-50 lbs. per c. ft. It is used for building and agricultural implements. The fruit is edible.

Fl. Apr., May, sometimes also in autumn. Fr. 3 months after flowering.

2. **E. Jambolana**, Lam.; Fl. Br. Ind. ii. 499; Brandis For. Flora 233; Gamble Man. Ind. Timb. 194. Vern. Jāman, Jāmūn, Hind.

A large evergreen tree; bark light-grey, fairly smooth, with shallow depressions caused by exfoliation. *Leaves* 3-6 by 1.5-2.5 in., very variable in shape, ovate-oblong or oblong-lanceolate, acuminate, coriaceous, tough, smooth, shining above except when very old; lateral nerves numerous, almost straight, very fine, uniting within the margin to form intramarginal nerves; petiole 3-1 in., channelled. *Flowers* tetramerous, small, greenish, subsessile, arranged in threes in lateral or terminal trichotomous panicles. *Calyx-tube* funnel-shaped; limb campanulate, subtruncate. *Petals* united into a calyptra and falling off in one piece. *Berry* 5-1 in. long, oblong-obovoid or sub-globose, pink while ripening, black smooth shining and very juicy when fully ripe, deep-pink below the thin elastic skin.

Very commonly associated with Sāl in the DŪN, less so in the SAHĀRANPUR FORESTS. It is almost gregarious in damp and swampy localities, mixed with laurels and other evergreen trees. It is also found in the Tons valley, JAUNSAH and TEHRI-GARHWAL, up to 4,000 ft., and along streams in the SAHĀRANPUR SIWALIKS.

The heartwood is reddish-brown, tough and hard, very durable under water, but less so and liable to warp if kept dry; weight about 45 lbs. per c. ft. It is used for building, agricultural implements and well-work, being especially suitable for use under water. The bark is used for dyeing and tanning and also in medicine. The fruit is eaten, and is considered good for people suffering from want of appetite or enlargement of the spleen. The kernel of the fruit is a specific for diabetes.



E. Jambos, Linn., Fl. Br. Ind. ii. 474. Vern. *Guláb Jámún* or *Guláb Jám*, Hind., the Rose-apple,—is cultivated for its fruit and for ornament in gardens in the DÚN. It is an evergreen tree with narrow-lanceolate acuminate shining leaves, and large white tassel-like tetramerous flowers in short cymose terminal racemes. Berry 1.2 in. long, obovoid or subglobose, crowned with the 4 persistent calyx-lobes, having a sweet taste and a delicate rose-water perfume when ripe, —whence the vernacular names.

2. *Careya*, Roxb.; G. P. n. 62.

1. *C. arborea*, Roxb.; Hook. Fl. Br. Ind. ii. 511; Brandis For. Flora 236; Gamble Man. Ind. Timb. 197. Vern. *Kúmbi*, *Kámbhi*, Hind.

A fairly large deciduous tree; bark dark-grey, exfoliating in thin narrow strips, fibrous inside. Leaves alternate, 6-12 by 3-6 in., obovate, oblanceolate or oblong, obtuse or shortly acuminate, sessile on narrowed into a very short marginate petiole, finely crenate or serrate, rather membranous, glabrous. Flowers sessile, 3-4 in. across, usually a few together in terminal spikes 3-8 in. long. Calyx-lobes 4, ovate, obtuse, imbricate; tube almost wholly adnate to the ovary, funnel-shaped. Petals 4, about 2 in. long, elliptic, white, very tender, caducous. Stamens very numerous, in several series; filaments red, filiform, 2.3 in. long, connate into a short tube below, the innermost and outermost without anthers. Ovary 4- rarely 5-celled; style long, simple, erect; ovules many, on axile placentas. Fruit globose, about 3 in. diam., crowned with the calyx-segments and the remains of the long filiform style.

Found only sporadically in the DÚN and SAHÁRANPUR FORESTS, usually in shady places.

The heartwood is scanty, dull-red or reddish-brown, mottled, even-grained, hard, strong and elastic, takes a good polish, seasons well and is very durable; the weight varies between wide limits, being 38-60 lbs. per c. ft. It is used for agricultural implements and cart-building, and is much sought after by boatmen in Assam for oars and rudders on account of its elasticity and durability. The bark is used in medicine, and fuzes, coarse cordage and sacks are made from the inner substance.

Fl. and new leaves Mar., Apr. Fr. July.

C. herbacea, Roxb.; Fl. Br. Ind. ii. 510, is a small perennial undershrub having a woody rootstock, found on grassy slopes of the SIWÁLIKs, and in the Pathri forest, SAHÁRANPUR. Leaves 6-8 by 2-3 in., obovate, oblanceolate or spatulate. Petals about 1.5-2 in. long, greenish-purple, elliptic. Fruit 1.5 in. diam., much like that of *C. arborea*.

The following Genera need only be briefly noticed:—

1. *PSIDIUM*, Linn.; *G. P. n.* 45. *Leaves* opposite, aromatic but not dotted. *Flowers* large, white, on axillary peduncles. *Calyx-tube* obovate; lobes 4-5, valvate. *Petals* free. *Fruit* a many-seeded berry.

P. Guava, Raddi.; *Fl. Br. Ind.* ii. 468. Vern. *Amrūd*, Hind.,—is the Guava tree of gardens. The wood is hard and even-grained and is used for wood engraving, instruments, and handles of spears.

2. *BARRINGTONIA*, Forst.; *G. P. n.* 61. *Leaves* alternate, crowded at the ends of the branches, crenate-serrate, not dotted. *Flowers* in long terminal or lateral racemes. *Calyx-tube* ovoid. *Petals* 4-5, imbricate. *Stamens* indefinite; filaments very long. *Fruit* fibrous or berry-like.

B. acutangula, Gærtn.; *Fl. Br. Ind.* ii. 508. Vern. *Sanāffar*, *Injar*, Hind.,—cultivated in gardens in DEHRA for its red flowers in long pendulous racemes. *Leaves* obovate, usually serrulate, narrowed into a short petiole. *Ovary* 2-celled. *Fruit* oblong, 4-angled.

3. *EUCALYPTUS*, L'Her.; *G. P. n.* 30. *Leaves* in saplings opposite, horizontal, cordate, sessile; in mature trees alternate, vertical, petiolate, ovate to lanceolate, acuminate, falcate. *Flowers* in umbels or heads. *Stamens* very numerous, capped in the bud with a caducous operculum. *Fruit* woody, consisting of the enlarged calyx-tube; seeds often very minute.

Many species of this very large Australian Genus have been introduced in India, and plantations of one of them,—*E. globulus*, Labill, the Blue Gum,—successfully made in the Nilgiris. The following species are growing fairly well in DEHRA and SAHÁRANPUR;—*E. tereticornes*, Smith, and *E. citriodora*, Hooker.

ORDER 39. MELASTOMACEÆ; *G. P. n.* 68.

Herbs or shrubs. *Leaves* opposite or whorled, simple, entire, 3-7-nerved from the base to the apex.



39. MELASTOMACEÆ.

[*Osbeckia*.]

Flowers usually terminal, regular, 2-sexual. *Calyx-tube* generally constricted above, more or less adnate to the ovary. *Petals* twisted in bud. *Stamens* 4-10, alternate stamens sometimes rudimentary; anthers usually opening by pores at the apex, connective tubercled or spurred. *Ovary* 4-5-celled; style simple, filiform. *Fruit* usually a many-seeded capsule.

This Order is of little interest in the SCHOOL CIRCLE, although some Genera as *Memecylon*, are common and important in the forests of Southern and Eastern India. The following plants of Genus *Osbeckia*, Linn.; *G. P. n.* 38,—need only be briefly noticed :—

1. *O. stellata*, Wall.; Fl. Br. Ind. ii. 517. A hairy shrub 4-6 ft. high with tetragonal branches, found at Chakrata, Mussoorie, etc. *Leaves* 3 in. long, lanceolate 5-nerved, with short hairs on both surfaces; petiole 4 in. *Flowers* purple, about 1 in. across. *Calyx* densely woolly outside. *Fruit* 5 in. long, ovoid, felted outside. Fl. Aug.-Oct.

2. *O. chinensis*, Linn., Fl. Br. Ind. ii. 515. An undershrub about 2 ft. high, found in damp localities in the DUN, e.g., Rámgarh. *Leaves* 2-3 in. long; narrow-oblong, 3-5-nerved, hairy; petiole 15 in. *Flowers* mauve. *Calyx* slightly pubescent outside, nearly glabrous in the fruit. *Fruit* ovoid, 3 in. long. Fl. Sept., Oct.

ORDER 40. LYTHRACEÆ; *G. P. n.* 69.

Trees, shrubs, or herbs, often with quadrangular branches. *Leaves* entire, generally opposite; stipules none. *Flowers* bisexual, usually regular, solitary or in cymes or panicles. *Calyx-tube* free, persistent; lobes 3-6, valvate. *Petals* as many as the calyx-lobes, and alternating with them, rarely absent. *Stamens* definite or indefinite, inserted on the calyx-tube. *Ovary* 2-6-celled, usually free; style long, persistent; ovules many, attached to an axile placenta. *Fruit* a capsule, 1-4- or many-celled; seeds numerous, without albumen.

Analysis of the Genera.

- Flowers irregular; ovary free. . . . 1. WOODFORDIA.
Flowers regular; ovary free.
Flowers 4-merous; stamens 8 2. LAWSONIA.
Flowers 6-merous; stamens indefinite . 3. LAGERSTROMIA.
Flowers regular; ovary inferior . . . 4. PUNICA.

1. Woodfordia, Salisb.; G. P. n. 8.

1. **W. floribunda**, Salisb.; Fl. Br. Ind. ii. 572; Brandis For. Flora 238; Gamble Man. Ind. Timb. 200. Vern. *Dhāulā, Dhāu,* Hind.

A large shrub with long spreading branches; stem more or less fluted, often with 1 or 2 concentric bands of cortical tissue inside the wood; bark smooth, peeling off in thin scales; young shoots and leaves with numerous black glands. *Leaves* opposite or sub-opposite, sometimes in whorls of 3, distichous, subsessile, 2-4 by 1-1.3 in., lanceolate or ovate-lanceolate, usually acuminate, rounded or cordate at the base, entire, pale and generally grey-pubescent beneath; lateral nerves 6-12 pairs, prominent beneath and joined by intramarginal veins. *Flowers* in short panicle axillary cymes, rarely solitary. Calyx 4-6 in. long, tubular, bright-red, curved, oblique at the mouth; teeth 6, short, with as many minute accessory lobes outside. *Petals* 6, white, acute, inserted in the sinuses of the calyx-tube and scarcely exceeding the calyx-teeth. *Stamens* 12, much exserted, declinate, inserted near the base of the calyx; filaments red; anthers versatile. *Ovary* 2-celled; ovules many, on axile placentas. (The stamens and styles are of varying lengths, the flowers thus becoming dimorphic or trimorphic). *Capsule* ellipsoid, included in the persistent calyx-tube; seeds many.

Very common in SAHÁRANPUR and the DŪN. Also in valleys up to 5,000 ft. in the HILLS, e.g., Ámlāwa, Pinālgādh, Dhārāgādh, Dhārmigādh, Tons and Pábar valleys, etc.

Wood reddish-white, close-grained, hard, weighing 46 lbs. per c. ft. It is suitable for axe-handles, but is used chiefly for fuel. The flowers give a red dye, which is used for dyeing silk. The bark is used in native medicine.

Fl. Feb.-Apr. Fr. Apr.-June.

2. Lawsonia, Linn.; G. P. n. 19.

1. **L. alba**, Lamb.; Fl. Br. Ind. ii. 573; Brandis For. Flora 238; Gamble Man. Ind. Timb. 200. Vern. *Mahādi,* Hind.



A shrub with thin greyish-brown bark; branchlets angular, sometimes spinescent. *Leaves* opposite, 7-1 in. long, elliptic, acute at both ends or the tip obtuse, minutely petioled, entire, coriaceous. *Flowers* 2 in. diam., greenish-white, sweet-scented, in large cymosely-branched terminal panicles. *Calyx-tube* exceedingly short; lobes 4, 1 in. long, ovate, persistent. *Petals* 4, wrinkled. *Stamens* usually 8, inserted in pairs between the petals. *Ovary* free, 4-celled; ovules many, on axile placentas; style long. *Capsule* 2 in. diam., globose, ultimately 1-celled, irregularly breaking up; seeds angular, on a central placenta.

It is cultivated in SAHÁRANPUR and the DÚN, indeed throughout India, as a hedge-plant, and also for its leaves, which are used to dye the nails, skin and beard. A plaster of the green leaves is said to be good for itches and other skin-diseases.

Fl. and fr. throughout the year.

3. *Lagerstœmia*, Linn.; G. P. n. 24.

Trees or shrubs. *Leaves* opposite (or the uppermost alternate), entire, short-petiolate. *Flowers* bracteate in axillary or terminal panicles. *Calyx-tube* funnel-shaped, smooth or grooved; lobes usually 6, ovate, valvate. *Petals* 6, long-clawed, inserted between the calyx-lobes. *Stamens* numerous; filaments filiform, exserted; anthers versatile. *Ovary* sessile, 3-6-celled; style filiform; ovules numerous, on axile placentas. *Capsule* coriaceous, 3-6-celled, loculicidally dehiscent, strongly seated on the persistent calyx; seeds winged.

1. *L. parviflora*, Roxb.; Fl. Br. Ind. ii. 575; Brandis For. Flora 239; Gamble Man. Ind. Timb. 200. Vern. *Dhaurá*, *Dhauri*, Dún; *Adhuári*, Saháranpur.

A fairly large deciduous tree; bark light-brown or ash-coloured, even, smooth, exfoliating in dark-coloured scurfy pieces. *Leaves* 2.5-4 in. long, oblong, acute or acuminate, coriaceous, glabrous above, glaucous and very closely reticulate beneath; petiole about 1 in. long. *Flowers* 2-3 in. across, white, fragrant, in lax axillary and terminal panicles. *Calyx* smooth, glabrous or pubescent. *Petals* very membranous, with a wavy margin. *Filaments* too weak to be straight, 6 of the outermost series longer than the rest. *Capsule* ovoid or cylindrical, 6-1 by 4-6 in., a quarter immersed in the somewhat accrescent and woody calyx; seeds with a terminal wing having a thick curved back, 5 in. long including the wing.



Fruit (in the wild state) about 1·5 in. diam., globose, with a reddish-brown coriaceous rind which ultimately breaks up irregularly; seeds about ½ in. long, angled, with a pellucid reddish-yellow or ruby-coloured aril filled with an acid or sweet juice. Under cultivation the fruit is about 3 in. diam., and very much better in quality.

The Pomegranate is cultivated in SAHÁRANPUR and the DŪN, and is found wild in valleys below 6,000 ft. in JAUNSAR and TEHRI-GARHWAL; Dhármigádh, Maindrot, Binálgádh, Khúnigádh, etc.

Wood light-yellow, compact and close-grained; weight 57 lbs. per c. ft. The flowers give a light red dye. The fruit is eaten, the bark and the rind of the fruit are very astringent, and are used in medicine and for tanning.

Fl. Apr., May. Fr. July-Sept.

ORDER 41. SAMYDACEÆ; G. P. N. 71.

Trees or shrubs. *Leaves* alternate, distichous, simple; stipules small, deciduous. *Flowers* regular, small, shortly pedicelled, often fascicled. *Calyx* coriaceous, persistent, free or adnate to the ovary; limb 3-7-fid. *Petals* imbricate, as many as, and alternating with, the calyx-lobes, or none. *Stamens* definite or indefinite, often with staminodes between. *Ovary* free or more or less adnate to the calyx-tube, 1-celled; style 1 or 2-5; ovules few or many, on usually 3 parietal placentas. *Fruit* a 1-celled, generally 2-5-valved, loculicidally-dehiscent capsule; seeds albuminous.

1. Casearia, Jacq.; G. P. n. 1.

Shrubs or small trees. *Leaves* entire or slightly serrate, often remotely punctate beneath; stipules small, caducous. *Flowers* greenish-yellow, small, fascicled. *Calyx-tube* short, with 4-5 imbricate lobes. *Petals* none. *Stamens* 6-15, alternating with as many staminodes or scales, usually united in a short hypogynous tube. *Ovary* superior, 1-celled, narrowed into a

short style; stigma 3-fid; ovules many, attached to 3-4 parietal placentas. *Fruit* fleshy, ovoid, usually 3-valved; seeds with a fleshy aril.

Analysis of the Species.

Leaves and branchlets glabrescent, the former elliptic. 1. *C. graveolens*.
Leaves and branchlets tomentose, the former oblong. 2. *C. tomentosa*.

1. ***C. graveolens***, Dalz.; Fl. Br. Ind. ii. 592; Brandis For. Flora 243; Gamble Man. Ind. Timb. 206. Vern. *Chilli*, Hind.; *Nará* or *Narhá*, Dún; *Phempri*, Garhwal.

A small deciduous tree with long horizontal branches; bark dark-grey, with white specks and a few longitudinal wrinkles. *Leaves* 4-8 by 2.5-4 in., elliptic, obtuse or shortly acute, more or less crenate, glabrous; lateral nerves 8-10 pairs; base rounded, sometimes acute; petiole 2.5 in. long; stipules 5 in. long, deciduous. *Flowers* glabrous, numerous, clustered in the axils of the leaves; pedicels short, jointed, pubescent below the joint. *Calyx* 5-lobed, pubescent. *Stamens* 8, alternating with hairy staminodial scales. *Fruit* 3-valved, 7-1 in. long, ellipsoid, glabrous.

Fairly common in certain parts of the DÚN FORESTS, less so in the SAHÁBANPUR DIVISION,—Tháno, Nágsidh, Asárori, Karwápáni, Dharmáwála, Pardúni; Ránipur, Dholkhand, etc.

Wood light-yellow, even-grained and moderately hard, weighing 40-50 lbs. per c. ft., used only for fuel. The fruit is used to poison fish.

Fl. May, June. Fr. July, Aug.

2. ***C. tomentosa***, Roxb.; Fl. Br. Ind. ii. 593; Brandis For. Flora. 243; Gamble Man. Ind. Timb. 206. Vern. *Chillá*, Hind.

A small deciduous tree with numerous horizontal branches; bark light-grey on branches but dark-brown on old stems, peeling off in square flakes; inner substance not fibrous. *Leaves* 3-7 by 1.7-3 in., oblong, elliptic-oblong or lanceolate, serrate or crenate, sometimes nearly entire, sub-coriaceous, tomentose, remotely gland-dotted; base rounded or acute, often oblique; petiole very variable in length; stipules minute, caducous. *Flowers* tomentose, small, greenish-yellow, numerous, fascicled in the axils of leaves; pedicels 2.3 in. long, hairy. *Calyx* 4-5-cleft, hairy. *Stamens* 8, alternating with hair scale-like staminodes. *Fruit* 3-valved, 7-8 in. long, obovoid, fleshy, yellow when ripe, 6-ribbed in dry specimens; seeds embedded in a receptacle.



Very common throughout the DŪN and SAHĀRANPUR FORESTS, especially in scrub-jungle and in the outskirts of Sāl forests.

Wood dirty-white or yellowish, even-grained, compact, moderately hard, strong and elastic; medullary rays fine and wavy; heart-wood not distinct; weight about 40 lbs. per c. ft. It is sometimes used for making combs. The pounded fruit is used to poison fish.

New leaves Mar., Apr. Fl. Mar.-May. Fr. June, July.

ORDER 42. ARALIACEÆ; G. P. n. 81.

Trees or shrubs, sometimes scandent. *Leaves* alternate, simple or compound, long-petioled: stipules adnate to the petiole, or absent. *Flowers* regular, small, sometimes polygamous, in umbels racemes or paniced beads; bracts and bracteoles small or conspicuous. *Calyx-tube* adnate to the ovary; limb short, truncate or with small teeth. *Petals* usually 5, valvate or sub-imbricate, deciduous. *Stamens* as many as, and alternating with, the petals, inserted on an epigynous disk; filaments inflexed; anthers versatile. *Ovary* inferior, 2- or more-celled; styles as many as the cells; ovules solitary, pendulous. *Fruit* a drupe or berry, sometimes 1-celled by suppression.

Analysis of the Genera.

Leaves simply or compoundly pinnate or. digitate.

Petals imbricate in bud.

Styles free

1. ARALIA.

Styles combined

2. PENTAPANAX.

Petals valvate in bud.

Leaves digitate; styles generally free

3. HEPTAPLEURUM.

Leaves tripinnate; styles always free

4. HETEROPANAX.

Leaves simple; (petals valvate; styles combined) 5. HEDERA.

1. Aralia, Linn.; G. P. n. 4.

1. *A. cachemirica*, Dene.; Fl. Br. Ind. ii. 722; Brandis Fr. Flora 248. Vern. *Akhōtā*, Jaunsar.



A large perennial herb, 5-10 ft. high. *Leaves* 2-pinnate, or 3-pinnate, 1.5-3 ft. long. *Leaflets* 3-9 on each pinna (secondary pinna if 3-pinnate), 3-5 by 1.5-2.5 in., ovate- or oblong-lanceolate, long-acuminate, obliquely rounded or cordate at the base, unequal-sided, doubly serrate, with distant short hairs above, generally hispid on the nerves beneath; rachises hispid; petiolules 0.1-3 in.; stipules 5-1 in. long, erect, fimbriate. *Flowers* in umbels, which are disposed in large terminal panicles often about a foot long. *Petals* 5, ovate, imbricate. *Stamens* 5. *Ovary* usually 5-celled; styles 5, free above the base. *Fruit* with 5 stones.

Extremely common in JAUNSAAR and TEHRI-GARHWAL, above 6,000 ft., generally in shady ravines.

New shoots Apr. Fl. June-Oct.

2. Pentapanax, Seem.; G. P. n. 5.

1. **P. parasiticum**, Seem.; Fl. Br. Ind. ii. 724; Brandis Fr. Flora 248.

A scandent soft-wooded shrub with rootlets at the nodes. *Leaves* simply imparipinnate, 6-10 in. long. *Leaflets* 5, 2-3 by 1-1.7 in., ovate-lanceolate, entire, rounded or sub-acute at the base, coriaceous, glabrous, glaucous beneath; petiolules 0.1 in. *Umbels* 2-8 in a short panicle; pedicels 5-7 in. long, jointed below the flowers, glabrous. *Flowers* pentamerous. *Petals* imbricate. *Styles* 5, long, combined to near the top. *Fruit* small, sub-globose, obscurely 5-angled.

MUSSOORIE HILLS (Mr. P. W. Mackinnon). Very scarce.

3. Heptapleurum, Gærtn.; G. P. n. 23.

1. **H. venulosum**, Seem.; Fl. Br. Ind. ii. 729; Brandis For. Flora 249; Gamble Man. Ind. Timb. 209. Vern. *Káth Semal*, *Kot Semal*, Dún.

A soft-wooded scandent shrub attaching itself to trees by adventitious rootlets. *Leaves* digitate; petiole 6-9 in. long; stipules 3-5 in. long, connate in the angle between the branch and the petiole, amplexicaul. *Leaflets* 5-7, 4-8 by 2-3.5 in., the middle one largest, elliptic-oblong or lanceolate, acuminate, entire, sub-acute or rounded at the base, coriaceous, glabrous, shining above; petiolules 1-2 in. long. *Flowers* about 2 in. diam., cream-coloured, umbelled; umbels in large twice-compound terminal panicles; pedicels 1-3 in.; bracts woolly, caducous. *Petals* 5-6, valvate. *Stamens* as many as the petals. *Ovary* with as many cells as the stamens; styles small, free. *Berry* 5-celled, 3-4 in. diam., globose, smooth, yellow.



42. ARALIACEÆ

[*Heptapleurum*.]

Fairly common in the DÚN: Lachiwála, Dúdhli, Mothronwála, Jhájrá, etc. Also found in the Tons valley, JAUNSAK and TEHRIGARHWAL.

Fl. Jan., Feb. Fr. Apr., May.

4. *Heteropanax*, Seem.; G. P. n. 31.

1. *H. fragrans*, Seem.; Fl. Br. Ind. ii. 734; Brandis For. Flora 249; Gamble Man. Ind. Timb. 208. Vern. *Tarlá*, Dún (i.e., larger than *Tarlú*—*Oroxylum indicum*, Vent.).

A small soft-wooded tree; bark soft, even, dark brownish-grey. *Leaves* tripinnate, 2-4 ft. long; petiole with a swollen base; stipules minute. *Leaflets* 3-5 by 1-7-3 in., ovate or elliptic, shortly acuminate, narrowed at the base, entire, glabrous; petiolules 0-4 in. long. *Panicles* about 3 ft. long, lowermost branches 1-1-5 ft., branchlets or umbel-bearing racemes 2-3 in., umbels sub-capitate. *Flowers* 2-3 in. diam., polygamous, small, yellow, fragrant. *Calyx* nearly truncate. *Petals* 5, valvate. *Stamens* 5. *Ovary* 2-celled; styles 2, distinct, filiform. *Fruit* 2-3 in. long, 3-4 in. broad 1 in. thick; seeds 2, flat, orbicular.

Fairly common in the DÚN and also in the SAHÁRANPUR SIWÁLIK: Kánsráo Pass, Tháno, Lachiwála, Dúdhli, Phandowála, Karwápáni; Sháhjahánpur Ráu, etc. The tree is likely to be mistaken, when not in flower and fruit, for *Oroxylum indicum*, Vent., which, however, has opposite leaves.

The leaves are lopped for cattle-fodder, and the Eri silkworm of Assam is fed on them.

Fl. Jan., Feb. Fr. Feb., Mar.

5. *Hedera*, Linn.; G. P. n. 35.

1. *H. Helix*, Linn.; Fl. Br. Ind. ii. 739. Brandis For. Flora 248; Gamble Man. Ind. Timb. 210. The Ivy. Vern. *Mithiári*, Jaunsar.

A large evergreen woody climber adhering to trees, rocks or walls by numerous fine adventitious rootlets. *Leaves* simple, extremely variable in size and shape, generally 2-5 in. long, often variously lobed, leathery, dark-green and shining above; margin entire; base cordate, rounded or cuneate; petiole slender, 5-2-5 in. long. *Flowers* polygamous, yellowish-green, in pedunculate globose umbels, which again are arranged in sub-corymbose panicles; peduncles 1-2 in. pedicels 5-8 in. long, both clothed with minute stellate scales. *Calyx* 5-toothed or nearly entire. *Petals* 5, valvate. *Stamens* 5. *Ovary* 5-celled; styles connate in a short column. *Fruit* 2-5-3 in.

diam., globose, yellow, turning black when fully ripe, shining; seeds 3-4, ovoid.

Common in JAUNSAE and TEHRI-GARHWAL, up to 9,500 ft. Also found in the Nakraunda and Mothronwála swamps in the DŪN, 1,800 ft.

Wood light-grey or yellow, soft and porous; annual rings distinct; weight 35 lbs. per c. ft. The leaves are a favourite fodder for sheep.

Fl. Oct.-Apr. Fr. Jan.-June.

ORDER 43. CORNACEÆ; G. P. N. 82.

Shrubs or trees. *Leaves* simple, opposite or alternate, usually entire, frequently unequal at the base; stipules none. *Flowers* regular, in axillary or terminal heads cymes or panicles. *Calyx-tube* adnate to the ovary; limb truncate or 4-5-toothed, persistent. *Petals* 4-5 or none. *Stamens* inserted with the petals and generally equal to them in number. *Disk* epigynous. *Ovary* inferior, 1-4-celled; style single; ovules pendulous, usually solitary. *Fruit* usually a succulent drupe with a 1-4-celled kernel, less often with two distinct stones; seeds pendulous, oblong, albuminous.

Analysis of the Genera.

(Adopted from Brandis For. Flora, p. 250.)

- | | |
|--|-------------|
| Leaves alternate; petals, anthers and style long. | |
| Flowers fasciculate; stamens numerous | 1. ALANGIUM |
| Flowers paniculate; stamens as many as the petals | 2. MARLEA. |
| Leaves generally opposite; petals, anthers and style short | 3. CORNUS. |

1. Alangium, Lamk.; G. P. n. 1.

1. **A. Lamarekii**, Thwaites; Fl. Br. Ind. ii. 741; Brandis For. Flora 250; Gamble Man. Ind. Timb. 211. Vern. *Akolá*, *Ankora*, Hind.; *Bismár*, Saháranpur.

A shrub or small tree, almost evergreen; branchlets spinescent; bark grey. *Leaves* alternate, simple, 3-6 in. long, membranous,



varying in shape from linear-oblong to elliptic, obtuse acute or acuminate, glabrous or nearly so; lateral nerves 5-8, fine; base acute or rounded; petiole 2-5 in. long, hairy. *Flowers* 6-8 in. long, white, fragrant, solitary or fascicled; inflorescence and calyx woolly. *Calyx* minutely 6-10-toothed. *Petals* 5-10, nearly 1 in. long, silky outside. *Stamens* up to 30, short, hairy; anthers very long. *Ovary* inferior, 1-celled; style long, filiform. *Fruit* a berry, 7 in. long, ellipsoidal, crowned with the enlarged calyx-limb, quite smooth, black outside when ripe, filled with a red pulp; endocarp bony; seeds oblong.

Occasionally met with along the foot of the SAHÁRANPUR SIWÁLIK: Ráunli, Ránipur, Jawálápur, etc. Not found in the DÚN.

Wood light-brown, fine- and smooth-grained, very tough and strong; weight 45-56 lbs. per c. ft. Used for pestles for oil-mills, wooden cattle-bells, carrying-poles and yokes. The bitter bark of the roots is used in native medicine, and the leaves often as poultice. The fruit is eaten, and an oil is extracted from the seeds which is used in medicine and also for burning.

New leaves Apr., May. Fl. Feb.-Apr. Fr. May-Aug.

2. *Marlea*, Roxb.; G. P. n. 2.

1. *M. begoniæfolia*, Roxb.; Fl. Br. Ind. ii. 743; Brandis For. Flora 251; Gamble Man. Ind. Timb. 211. Vern *Bhút Kainju*, Jaunsar; *Garh Kimu*, Dún.

A small tree with smooth grey bark; branches horizontal; young parts pubescent. *Leaves* alternate, simple, 3-10 in. long, varying from orbicular to broad-oblong, acuminate, distantly angular-lobed or quite entire, usually glabrous above when mature; base unequal, from cuneate to deeply cordate, with 3-5 basal nerves; petiole 1-1.5 in. long. *Flowers* 6-9 in. long, 2-sexual, white, in axillary dichotomously-compound cymes. *Calyx* shortly-toothed. *Petals* usually 6-8, strap-shaped, 5-7 in. long, white, slightly hairy. *Stamens* 6-8; filaments short, hairy. *Ovary* usually 2-celled; ovules 2, pendulous; style long, glabrous; stigma capitate. *Fruit* a drupe, 3-5 in. long, ovoid, obscurely ribbed, glabrous, crowned with the persistent calyx-limb still, encircling the disk; seeds oblong, compressed.

Valleys up to 5,000 ft. in JAUNSAAR and TEHRI-GARHWAL, and in the OUTER HIMALAYAN HILLS: Bínálgádh, Thadiár; Paléd, above Rájpur, etc. Also in the Nakraunda swamp in the DÚN, 1,900 ft.

The wood is even-grained, white and soft, used in building huts in Sylhet. The leaves are given as fodder to sheep and cattle.

Fl. Mar.-May. Fr. July-Oct.



43. CORNACEÆ.

CSL
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3. *Cornus*, Linn.; G. P. n. 5.

Trees or shrubs. *Leaves* entire, usually opposite. *Flowers* small, bisexual, in cymes or heads. *Calyx* 4-toothed; tube campanulate or urn-shaped. *Petals* 4, oblong, valvate. *Stamens* 4, alternating with the petals; anthers oblong, versatile. *Ovary* usually 2-lobed; ovules solitary, pendulous; style short, club-shaped. *Fruit* a 2-celled, 2-seeded drupe; endocarp bony.

Analysis of the Species.

Flowers in compound cymes, without bracts;
drupes free.

Leaves broad-ovate, glabrous and glaucous
beneath

1. *C. macrophylla*.

Leaves narrow-oblong, glabrous or minutely
hairy and green beneath

2. *C. oblonga*.

Flowers in dense heads subtended by 4 large
white bracts; drupes confluent

3. *C. capitata*.

1. ***C. macrophylla***, Wall.; Fl. Br. Ind. ii. 744; Brandis For. Flora 252; Gamble Man. Ind. Timb. 212. Vern. *Kágshi*, *Khágsha*, *Khákshá*, Jaunsar.

A middle-sized tree with rough brown bark and horizontal branches. *Leaves* opposite, rarely a few alternate, 6 by 4 in., ovate, sometimes unequally divided by the midrib, acuminate, glabrescent above, glaucous beneath; lateral nerves 5-8 pairs, arcuate; base sub-acute rounded or rarely slightly cordate; petiole 1 in. *Panicles* terminal, with several pairs of usually-opposite branches and dichotomous branchlets bearing cymes. *Calyx-tube* urn-shaped, covered with white adpressed hairs. *Petals* 2-3 in. long, strap-shaped, valvate, hairy outside. *Drupe* globose, 2 in. long, crowned with the remains of the calyx-tube and the disk.

Fairly common in JAUNSAR and TEHRI-GARHWAL, 4,-8,000 ft. especially in shady depressions: Chakrata, Lokhár, Kathián, Dhármigath valley, Deotá, Kúlni, etc.

Wood pinkish-white, hard, close-grained, but warps badly, noted as yielding excellent charcoal for gun-powder; weight about 45 lbs. per c. ft. The leaves are lopped for goat fodder, and the fruit is eaten.

Fl. Apr., May. Fr. June, July.

2. ***C. oblonga***, Wall.; Fl. Br. Ind. ii. 744; Brandis For. lora 253; Gamble Man. Ind. Timb. 212. Vern. *Korhoi*, Jaunsar.



43. CORNACEÆ.

[*Cornus*.]

A small tree with reddish-brown rough bark. *Leaves* opposite, sometimes a few alternate, 2-6 by 7-1.5 in., narrowly oblong or elliptic, narrowed at both ends, sub-coriaceous, glabrescent above; lateral nerves 3-6 pairs, arcuate, prominent below, often glandular at the axils; petiole 2-6 in. long. *Panicle* of cymes terminal, pubescent. *Calyx-tube* campanulate, slightly hairy. *Petals* about 2 in. long, almost glabrous. *Drupe* ovoid, about 3 in. long, crowned as in the last species.

OUTER HIMALAYAN HILLS, JAUNSAAR and TEHRI-GARHWAL, 3,700 ft.: Mussoorie. Láduakôt, Korwá, Kathián, Bámsu, etc.

Wood pinkish-white, hard and even-grained, warps in seasoning. Weight 46-50 lbs. per c. ft.

Fl. Sept.-Dec. Fr. Jan.-Apr.

3. *C. capitata*, Wall.; Fl. Br. Ind. ii. 745; Brandis For. Flora 253; Gamble Man. Ind. Timb. 212. Vern. *Thanboi*, Jaunsar; *Bhamorá*, Garhwal.

A small deciduous tree with greyish-brown bark; young branches and leaves rough with short adpressed hairs. *Leaves* opposite, approximate at the ends of the branchlets, 2-3.5 by 1.2-1.5 in., oblong or elliptic, coriaceous, pale beneath, lateral nerves usually 4 pairs, arcuate; petiole 5 in. long, channelled, with a broad base. *Bracts* 4, 1 by 8 in., white or yellowish. *Heads* hemispherical, 5 in. diam. *Flowers* small, closely packed in the head. *Calyx-teeth* reflexed. *Fruits* coalesced in a fleshy strawberry-like head 1 in. diam.; endocarp solitary, about 15 in. long, 1-seeded, bony, compressed, angular.

OUTER HIMALAYA and JAUNSAAR, from 3,500 to 8,000 ft.: Soitoli, Dhárágádh, Kathián, Nágthát, below Mussoorie, etc.

Wood very hard and close-grained, but warps in seasoning. Weight 45 lbs. per c. ft. Used chiefly for fuel. The fruit when ripe is red, and is eaten and made into preserves.

Fl. Apr.-Oct. Fr. Nov.-Jan.

GAMOPETALÆ.

ORDER 44. CAPRIFOLIACEÆ; G. P. N. 83.

SHRUBS or small trees, rarely herbs. *Leaves* opposite or ternate; stipules generally absent. *Flowers* bisexual, regular or irregular. *Calyx-tube* adnate to the ovary; limbs 3-5-lobed. *Corolla* gamopetalous, often 2-lipped; lobes 5, imbricate in bud. *Stamens* 5, rarely fewer or more, inserted on the corolla-tube between the lobes; anthers versatile. *Ovary* inferior, 1-6-celled; ovules solitary and pendulous, or several on axile placentas. *Fruit* a berry, or a drupe, rarely a capsule; seeds with copious fleshy albumen.

Analysis of the Genera.

Corolla-tube straight, limb not lipped.

Fruit 1-seeded; stem solid.

Leaves generally toothed or serrate; calyx-lobes not elongated

1. VIBURNUM.

Leaves entire; calyx-lobes elongated and feathery

2. ABELIA.

Fruit many-seeded; stem hollow

4. LEYCESTERIA.

Corolla-tube oblique, more or less lipped; (fruit many-seeded; leaves entire)

3. LONICERA.

1. Viburnum, Linn.; G. P. n. 3.

Shrubs or small trees. *Leaves* simple, opposite, sometimes ternate, generally serrate or toothed. *Flowers* white or pink, in terminal or axillary corymbs or panicles. *Calyx-limbs* short, 5-toothed. *Corolla* 5-lobed. *Stamens* 5. *Ovary* 1-3-celled with 1 pendulous ovule in each cell; style short, or stigma sessile. *Fruit* drupe, usually 1-celled, 1-seeded.

Analysis of the Species.

Flowers in corymbs, appearing with or after the leaves.

Leaves serrate.

Leaves obtuse, woolly beneath . . . 1. *V. cotinifolium*.

Leaves acuminate, stellate-pubescent beneath . . . 2. *V. stellulatum*.

Leaves entire, glabrous . . . 3. *V. coriaceum*.

Flowers in panicles, appearing before the leaves.

Corolla-tube less than half an inch long ;
adult leaves hairy beneath . . . 4. *V. nervosum*.

Corolla-tube half an inch or more ; adult
leaves glabrous. 5. *V. fœtens*.

1. ***V. cotinifolium***, Don ; Fl. Br. Ind. iii. 3 ; Brandis For. Flora 358 ; Gamble Man. Ind. Timb. 214. Vern. *Bhutnoi*, Jaunsar.

A large deciduous shrub with greyish bark. *Leaves* 3-3.5 in. long, ovate, elliptic or orbicular, obtuse, crenulate or nearly entire, rugose, woolly beneath ; base obtuse or subcordate ; lateral nerves 5-6 pairs, branching. *Flowers* generally in dense terminal corymbs which are 3-4 in. diam. ; bracteoles linear. *Calyx-lobes* short. *Corolla-tube* 2 in. long, turbinate, white tinged with pink ; lobes round. *Style* very short, conical. *Drupe* 3 in. long, oblong, compressed, ribbed, red.

Abundant in JAUNSAAR and TEHRI-GARHWAL, above 4,000 ft., affecting open sunny aspects.

Wood white, hard and close-grained. The ripe fruit is eaten.

Fl. Apr.-June. Fr. July, Aug.

2. ***V. stellulatum***, Wall. ; Fl. Br. Ind. iii. 4 ; Brandis For. Flora 258, 576. Syn. *V. Mullaha*, Ham. ; Gamble Man. Ind. Timb. 214. Vern. *Richhoi*, Jaunsar.

A shrub with long branches, and dark-grey almost black bark. *Leaves* 3-4 by 1.5-2 in., ovate or ovate-lanceolate, long-acuminate, distantly sharp-toothed, membranous, glabrous above, sparingly stellate-pubescent beneath ; base rounded or subacute ; petiole 3-1 in. long. *Flowers* small, very numerous, in large umbellate terminal corymbs. *Calyx-tube* stellately hairy. *Corolla* rotate, white, pubescent ; lobes round. *Drupe* 25 by 2 in., broadly oblong, compressed, bright-red when ripe.

Fairly common in JAUNSAAR and TEHRI-GARHWAL, above 6,000 ft., generally in cool shady localities : Deoban, Mundali, Deotâ, etc.

Walking-sticks are often made of the branches. The acid fruit is eaten.

Fl. July, Aug. Fr. Sept., Oct.

3. **V. coriaceum**, Bl. ; Fl. Br. Ind. iii. 5 ; Brandis For. Flora 259 ; Gamble Man. Ind. Timb. 214. Vern. *Rashniā*, Jaunsar.

A shrub or small tree with grey bark. *Leaves* 4-9 by 1·5-2·5 in., oblong, acuminate, entire, thickly coriaceous, glabrous ; lateral nerves 3-4 pairs, arcuate ; petiole 5-1 in. long. *Flowers* 25 in. long, numerous, in terminal umbellate corymbs ; bracts 0. *Calyx-tube* truncate, glabrous. *Corolla* white, tubular. *Drupe* 2 in. long, 1-celled, black.

JAUNSAR and TEHRI-GARHWAL, 4,700 ft. ; also the OUTER HIMALAYA : Korwā forest, Kathiān, Moltā, both slopes of the Mussoorie hill, Mālkōt forest, etc.

Wood white, hard, close-grained, weighing 50 lbs. per c. ft. An oil is said to be extracted from the seeds in Nepal.

Fl. May, June. Fr. July, Aug.

4. **V. nervosum**, Don ; Fl. Br. Ind. iii. 8. Brandis For. Flora 259 ; Gamble Man. Ind. Timb. 214. Vern. *Tirnoi*, Jaunsar.

A shrub with stout grey or brownish branches. *Leaves* 2·5-3·5 by 1·3-1·5 in., elliptic-oblong, acute, serrate, glabrous above, hairy on the nerves beneath ; lateral nerves 8-10 pairs, prominent, closely parallel ; base cuneate ; petiole 3-6 in. long. *Panicles* compact, silky ; branches short. *Calyx-tube* glabrous. *Corolla-tube* 3-5 in. long ; lobes elliptic, light-rosy. *Stamens* in 2 series, 2 above and 3 below. *Drupe* ellipsoid, up to 3 in. long.

TEHRI-GARHWAL FORESTS, above 9,000 ft. ; Rikhsin. Rather scarce.

Fl. Apr., May. Fr. May, June.

5. **V. foetens**, Dene. Fl. Br. Ind. iii. 8 ; Brandis For. Flora 259 ; Gamble Man. Ind. Timb. 215. Vern. *Tirnoi*, Jaunsar.

A shrub very closely resembling the last species. *Leaves* about 4 in. long, elliptic or oblong, serrate, glabrous, emitting a strong unpleasant smell ; nerves 7-9 pairs, distantly parallel. *Panicles* lax ; branches glabrous or nearly so. *Flowers* sweet-scented. *Corolla tube* 5-7 in. long ; lobes rosy. *Drupe* up to 5 in. long, ellipsoid, red.

Fairly common in JAUNSAAR and TEHRI-GARHWAL, above 8,000 ft. : Deoban, Mundāli, Deotā, etc.

The fruit is said to be edible.

Fl. May, June. Fr. July, Aug.



44. CAPRIFOLIACEÆ.

[*Abelia*]
SL

2. *Abelia*, Brown ; G. P. n. 7.

1. *A. triflora*, Br. ; Fl. Br. Ind. iii. 9 ; Brandis For. Flora 257 ; Gamble Man. Ind. Timb. 215. Vern. *Máli*, *Málé*, Jaunsar.

A large shrub ; branches long, fluted ; branchlets slender and often drooping ; bark grey. *Leaves* 2-3 by 7-13 in., ovate-lanceolate, hairy all over or only along the margin and the midrib, finely reticulate ; petioles short, often connate at the base. *Flowers* scented, 4-6 in. long, usually 3 together in dense bracteate heads or cymes ; bracts and bracteoles foliaceous. *Calyx-lobes*, 5-1 in. long in fruit, ciliate, with a distinct midrib. *Corolla* tubular, funnel-shaped or with a wide mouth, pinkish-white. *Fruit* 2-3 in. long, linear-oblong, dry.

Fairly common in JAUNSAAR and TEHRI-GARHWAL, above 4,000 ft., frequently on calcareous soils : Deoban, Bodyár, Mundáli, Dhára-gádh, Bámsu, Deotá, etc.

Wood bluish-white, hard, close and even-grained ; weight 65 lbs. per c. ft. Walking-sticks are often made of the branches, and the leaves are browsed by goats.

Fl. May-July. Fr. July-Oct.

3. *Lonicera*, Linn. ; G. P. n. 9.

Shrubs, erect or scandent. *Leaves* opposite, entire. *Flowers* in peduncled pairs, often connate by their ovaries, supported by bracts and bracteoles ; peduncles axillary or subterminal. *Calyx-tube* ovoid ; limb short, 5-toothed. *Corolla* tubular, limb oblique or 2-lipped, 5-lobed. *Stamens* 5. *Ovary* 2-3-celled ; ovules many in each cell, in double rows ; style slender ; stigma capitate. *Fruit* a fleshy berry, often 2 connate into 1, 2-3-celled ; seeds few in each cell ; albumen fleshy.

Analysis of the Species.

Corolla not distinctly 2-lipped.

Leaves oblong ; fruit black.

Leaves lanceolate ; fruit red.

Corolla distinctly 2-lipped.

Fruits free.

Peduncles extremely short

Peduncles 1-2 in. long

Fruits confluent

1. *L. purpurascens*.

2. *L. angustifolia*.

3. *L. quinquelocularis*.

5. *L. alpigena*.

4. *L. orientalis*.

1. **L. purpurascens**, Hook. f. & T.; Fl. Br. Ind. iii. 12; Brandis For. Flora 255.

A small shrub; branches dark-grey; bark peeling off in thin shreds. *Leaves* 1·5 by ·5 in. or less, oblong or obovate-oblong, pilose or glabrescent above, usually villous beneath. *Bracts* linear. *Corolla* 5·7 in. long, hairy, purple, funnel-shaped. *Style* hairy. *Fruit* globose, black when ripe.

TEHRI-GARHWAL, above 10,000 ft.: Rikhshin.

Fl. May, June.

2. **L. angustifolia**, Wall.; Fl. Br. Ind. iii. 13; Brandis For. Flora 255; Gamble Man. Ind. Timb. 217. Vern. *Geáng*, *Chalú*, *Pirlú*, *Banchilú*, Jaunsar.

A small shrub with smooth grey bark which exfoliates in long papery flakes. *Leaves* 1·5 by ·5 in., lanceolate or oblong-lanceolate, pale and nearly glabrous beneath. *Flowers* in pairs on slender axillary peduncles 5-1 in. long; bracts linear; bracteoles connate, enclosing the confluent ovaries. *Corolla* white tinged with rose, 2·4 in. long, scented; lobes subequal. *Style* short, glabrous. *Fruit* confluent, globose, bright ruby-colour and translucent when ripe; seeds few.

Common in JAUNSAAR and TEHRI-GARHWAL, above 6,000 ft.

Wood hard and very close-grained. Good walking-sticks can be made of the branches if found long and thick enough. The fruit is sweetish and is greedily eaten by the hill people.

Fl. May, June. Fr. July, Aug.

3. **L. quinquelocularis**, Hardwick; Fl. Br. Ind. iii. 14; Brandis For. Flora 255; Gamble Man. Ind. Timb. 216. The Himalayan Honey-suckle. Vern. *Taknoi*, Jaunsar.

A large shrub, occasionally a small tree; bark grey, with longitudinal fissures, peeling off in long shreds; branchlets pubescent. *Leaves* 1·5-3 by 1-2 in., obovate or ovate-lanceolate, acute or obtuse at either end, glabrate above, pilose beneath. *Flowers* clustered, axillary; peduncles extremely short; bracts linear, ciliate; bracteoles obtuse, connate at the base. *Calyx-limb* cup-shaped, hairy. *Corolla* 7-12 in. long, white, fading into pale-yellow, hairy. *Style* hairy, exserted. *Berries* not connate, brownish-black when ripe.

Fairly common throughout the OUTER HIMALAYA, JAUNSAAR and TEHRI-GARHWAL, 2,500-9,000 ft.

Wood greyish-white, hard and close-grained; takes a fine polish, but is used chiefly for fuel; weight 52 lbs. per c. ft. Cattle are



fed on the leaves. The branches are sometimes used for walking-sticks.

Fl. May, June.

4. ***L. orientalis***, Lamk.; Fl. Br. Ind. iii. 15; Brandis For. Flora 256; Gamble Man. Ind. Timb. 216. Vern. *Tuknoi*, Jaunsar.

A large shrub with compressed horizontal branches; bark peeling off in thin shreds. *Leaves* 2-4 by 1.5-2.5 in., ovate or ovate-lanceolate, acute at both ends, mucronate, more or less pubescent beneath; nerves 10-12 pairs, slender. *Peduncles* .5-1 in. long, thickened upwards; bracts linear-lanceolate; bracteoles small and rounded, or none. *Calyx-lobes* linear-lanceolate. *Corolla* pink, nearly glabrous outside, deeply 2-lipped, gibbous at the base; tube very short. *Style* hairy. *Berries* confluent, black when ripe.

JAUNSAR and TEHRI-GARHWAL, above 6,000 ft.; Mundáli, Deoban, etc.

Fl. June.

5. ***L. alpigena***, Linn.; Fl. Br. Ind. iii. 15; Brandis For. Flora 256; Gamble Man. Ind. Timb. 217. Vern. *Phulor*, Jaunsar.

A shrub with pubescent branchlets, and grey-brown bark which peels off in irregular papery flakes. *Leaves* 3-4 by 1-2 in., elliptic-oblong or ovate-lanceolate, long-acuminate, glabrate above, pilose beneath; base rounded or cuneate; nerves 6-8 pairs, slanting. *Peduncles* 1-2 in. long, thickened upwards; bracts lanceolate or linear; bracteoles small. *Calyx-tube* pubescent; limb short. *Corolla* glandular-hairy, very gibbous at the base. *Fruit* not connate.

JAUNSAR and TEHRI-GARHWAL, above 8,000 ft., not common: Mundáli, Deotá, Rikhshin, etc.

Fl. May, June.

4. *Leycesteria*, Wall.; G. P. n. 10.

1. ***L. formosa***, Wall.; Fl. Br. Ind. iii. 16; Brandis For. Flora 56; Gamble Man. Ind. Timb. 217. Vern. *Bhúj-nali*, Jaunsar; *Dándá Bhekar*, Garh.

A bushy shrub (perennial herb?) with grey stems and deep-green hollow branches, usually from near the base. *Leaves* opposite, 2-5 by 1-3 in., ovate or ovate-lanceolate, long-acuminate, entire or with the margins irregularly uneven, membranous, glaucous or puberulous beneath, glabrous or slightly scabrous above; base from subacute to cordate; petioles .2-1 in. long, connate at the base. *Flowers* about 1 in. long, sessile, in axillary or terminal bracteate

whorls; bracts sessile, greenish-purple, ovate or ovate-lanceolate, generally connate at the base; bracteoles very variable. *Calyx-lobes* 5, unequal, persistent. *Corolla* funnel-shaped, swollen at the base, red or white with a purplish tinge. *Fruit* a fleshy berry, 5 in. long, subglobose, dark-purple when fully ripe, glandular-hairy, usually 5-celled, many-seeded.

Fairly common in cool shady forests in JAUNSAIR: Deoban^o Mundali, etc.

The hollow stems are made into toy flutes and trumpets by Jaunsari shepherd boys.

Fl. June, July. Fr. July, Aug.

ORDER 45. RUBIACEÆ; G. P. N. 84.

Trees, shrubs or herbs. *Leaves* simple, opposite or whorled, entire, stipulate; stipules inter or intra-petiolar, free or adnate to the petioles, or forming a sheath round the stem. *Inflorescence* various. *Calyx-tube* adnate to the ovary; limb entire or toothed. *Corolla* gamopetalous, regular; lobes usually 4-5, valvate imbricate or contorted in the bud. *Stamens* as many as the corolla-lobes and alternating with them, inserted on the corolla-tube; anthers versatile. *Ovary* inferior, 2- or more-celled, rarely 1-celled; ovules 1 or more in each cell. *Fruit* various; seeds usually with a fleshy or horny albumen.

Analysis of the Genera.

A. Fruit capsular.

B. Ovary 2-celled, cells many-seeded.

Corolla-lobes valvate in bud.

Flowers in dense globose heads.

Calyx 5-lobed; no bract-like leaves . . . 1. ADINA.

Calyx truncate; inflorescence supported by bract-like leaves . . . 2. STEPHEGNE.

Flowers in paniced spikes supported by large leafy bracts. . . 3. HYMENODICTYON

Corolla-lobes imbricate in bud; flowers in large terminal panicles. . . 4. WENDLANDIA.



45. RUBIACEÆ.

[*Adina*.
SL

- BB. Ovary 5-celled, seeds solitary in each cell ; corolla-lobes valvate in bud.
 Capsule 1-celled, 5-valved only at the top ; bracteoles free 9. HAMILTONIA.
 Capsule 5-celled to the base ; bracteoles connate. 10. LEPTODERMIS.
- AA. Fruit indehiscent ; corolla lobes twisted in bud.
 Fruit with a pair of 1-seeded crustaceous pyrenes.
 Flowers in trichotomous corymbose panicles 7. PAVETTA.
 Flowers axillary, fascicled or solitary 8. COFFEA.
 Fruit fleshy, seeds more than 1 in each cell ; (flowers axillary, fascicled or solitary).
 Ovary 2-celled ; placentas on the septum 5. RANDIA.
 Ovary 1-celled ; placentas parietal 6. GARDENIA.

1. *Adina*, Salisb.; G. P. n. 4.

1. *A. cordifolia*, Hook. f. ; Fl. Br. Ind. iii. 24 ; Brandis For. Flora 263 ; Gamble Man. Ind. Timb. 220. Vern. *Haldū*, Hind.

A large deciduous tree, often buttressed ; bark grey or brownish-grey, rough, inner substance reddish-brown with streaks of white. *Leaves* opposite, 4-9 in. diam., orbicular, cordate, abruptly acuminate, coriaceous, glabrate above, pubescent beneath ; petiole 3-4 in. long ; stipules 5-8 in. long, triangular, elliptic or obovate, brown, concealing the uppermost pair of leaf-buds. *Flowers* yellow, downy, bracteolate, in globose peduncled heads which are 7-1 in. diam. ; receptacle hairy ; peduncles axillary, 2-4 in. long, usually with one head. *Calyx-tube* 5-angled ; limb 5-lobed. *Corolla* trumpet-shaped ; tube long, glabrous inside ; lobes valvate. *Stamens* 5, inserted in the mouth of the corolla-tube, filaments short. *Ovary* 2-celled ; ovules many in each cell ; style filiform, long-exserted. *Capsules* 200-300 in each head, of 2 dehiscent cocci, dry, many-seeded ; seeds oblong, winged, very minute.

A common tree throughout the DŪN and SAHĀRANPUR FORESTS and in the OUTER HIMALAYA, usually overtopping all other trees, and can be easily recognized from a distance by its dark-green umbrageous crown.

Wood yellow when fresh-cut, afterwards changing into reddish-brown, even-grained, compact, moderately hard ; weight 40-50 lbs. per c. ft. ; heartwood and annual rings not distinct. It seasons well, works easily, takes a good polish and is fairly durable. Used for construction, furniture and agricultural implements. In the School Circle there is a special demand for good trees, which are carted down to Sahāranpur to be made into combs, writing-tablets and ornamental platters.



Leafless for a short time in May. Fl. June, July. Seeds ripen in the cold season.

2. *Stephegyne*, Korth.; G. P. n. 5.

1. *S. parvifolia*, Korth.; Fl. Br. Ind. iii. 25; Brandis For. Flora 262; Gamble Man. Ind. Timb. 222. Vern. *Kāem*, Hind.; *Phaldú*, Garhwal.

A large deciduous tree; trunk irregularly shaped, often buttressed; bark brownish or greenish-grey, smooth, with shallow depressions left by exfoliating scales. *Leaves* opposite, very variable, 2-6 in. long, orbicular, oblong, ovate or obovate, coriaceous, glabrous or pubescent; lateral nerves 6-8 pairs, oblique; base cuneate to subcordate; stipules obovate, pale, membranous. *Flowers* white or light-yellow, bracteolate, glabrous inside, in globose heads about 1 in. diam. *Peduncles* 5-3 in. long, simple or trichotomously divided to form usually 3-headed panicles, supported by a pair of bract-like oblong leaves narrowed into a long slender petiole; bracteoles spathulate, minute. *Calyx-tube* short; limb truncate or minutely 5-toothed. *Corolla* trumpet-shaped; lobes 5, valvate. *Stamens* 5, inserted on the throat of the corolla-tube; filaments short. *Ovary* 2-celled; ovules many in each cell; style filiform, much exserted; stigma cylindrical, with a concave base. *Capsules* 100-150 in each head, dry, 12 in. long, of 2 dehiscent cocci; seeds many, winged, minute.

Abundant in the SAHÁRANPUR DIVISION, and fairly common in the DÚN. Some individuals attain an enormous size, e.g., those in the Dholkhand camping-ground.

Wood light pinkish-brown, close- and fine-grained, generally harder than that of *Adina cordifolia*; weight about 42 lbs. per c. ft. Heartwood not distinct; rings visible. Used generally for the same purposes as *Haldú*. The leaves are used for fodder.

Leafless Apr., May. Fl. June, July. Fr. Nov.-Jan.

Allied to the two preceding trees is *Anthocephalus Cadamba*, Miq.; Fl. Br. Ind. iii. 23. Vern. *Meo*, E. DÚN;—a large handsome tree, a few individuals of which, probably originally planted, are found near the old Khairi fort, E. DÚN. *Leaves* resembling those of *Holarrhena antidysenterica*. *Flower-heads* about 2 in. diam. The ripe fruit is acid and is eaten raw or cooked.—G. P. n. 2.

3. *Hymenodictyon*, Wall.; G. P. n. 19.

1. *H. excelsum*, Wall.; Fl. Br. Ind. iii. 35; Brandis For. Flora 267; Gamble Man. Ind. Timb. 224. Vern. *Bhauan*, DÚN; *Kúkurkát*, Hind.



A large deciduous tree ; bark soft, brownish-grey, smooth on branches and poles, corky and furrowed on the stems of mature trees. *Leaves* opposite, 4-10 by 3-5 in., elliptic or obovate-oblong, acuminate, often obtuse or rounded, membranous, pubescent ; lateral nerves 7-10 pairs ; base acute ; petiole 1-3 in. ; stipules oblong with a broad base, caducous, usually glandular-serrate ; floral leaves long-petioled, strongly nerved. *Flowers* about .2 in. long, white, fragrant, in large terminal panicles with bracteate spicate branches ; pedicels very short ; bracts large, leafy, persistent. *Calyx-tube* short ; lobes 5-6, deciduous. *Corolla* .2 in. long, funnel-shaped, pilose outside ; lobes 5, short, valvate. *Stamens* 5 ; filaments dilated upwards ; anthers linear. *Ovary* 2-celled ; ovules numerous ; style long-exserted ; stigma spindle-shaped. *Fruit* a loculicidally dehiscent capsule, .5-.7 in. long, on short recurved pedicels, ellipsoid, 2-valved, many-seeded ; seeds flat, lenticular, winged all round the margin, .3 by .1 in. including the wing.

Not uncommon in the S4l forests of the DÚN DIVISION although rare in the WESTERN DÚN, and frequently met with in the better class of SAHÁRANPUR FORESTS : Phándowála, Lachiwála, Tháno, Mohand, etc.

Wood brownish-grey, close-grained but light and soft ; heart-wood not distinct ; weight about 30 lbs. per c. ft. Used for agricultural implements, palanquins, scabbards, toys and similar other articles. The bark is used for tanning and as a febrifuge, and the leaves as cattle-fodder.

Leafless Nov.-May. Fl. June-Aug. Fr. Cold season.

4. *Wendlandia*, Bartl. ; G. P. n. 62.

Shrubs or small trees. *Leaves* opposite or ternately whorled. *Flowers* small, white or rosy, in terminal paniced cymes, 2-3-bracteolate. *Calyx-lobes* 4-5, subequal, persistent. *Corolla* tubular or funnel-shaped ; lobes 4-5, imbricate in bud. *Stamens* 4-5, between the corolla-lobes ; anthers exserted. *Ovary* usually 2-celled ; cells many-seeded ; style slender ; stigma entire or bifid. *Capsule* globose, 2-valved, many-seeded ; seeds very minute, obscurely winged.

Analysis of the Species.

Stipules recurved ; leaves at least three times as long as broad ; lateral nerves 12-20 pairs	1. <i>W. exserta</i> .
Stipules erect ; leaves about twice as long as broad ; lateral nerves 10-12 pairs	2. <i>W. puberula</i> .

1. **W. exserta**, DC.; Fl. Br. Ind. iii. 37; Brandis For. Flora 268; Gamble Man. Ind. Timb. 225. Vern. *Bathuá*, E. Saháranpur; *Chaulái*, W. Saháranpur.

A small deciduous tree; bark rough, brown, longitudinally cracked, and exfoliating in long strips; branchlets, leaves and inflorescence grey-tomentose. *Leaves* 4-9 by 1-3.5 in., ovate ovate-lanceolate or narrow-oblong, finely acuminate, coriaceous, sometimes glabrate above, often densely pubescent beneath; lateral nerves 12-20 pairs, parallel; petiole .5-1 in. long; stipules interpetiolar, ovate, acute, recurved. *Flowers* sessile, .15 in. diam., dull-white, fragrant, in cymes which again are disposed in large very dense conical terminal panicles much exceeding the leaves. *Calyx*-lobes 4-5, ovate or subulate, persistent. *Corolla* funnel-shaped; lobes imbricate in bud. *Anthers* versatile, exserted. *Ovary* 2-celled. *Capsules* .1 in. long, white-tomentose.

Very common in the SIWALIK TRACTS, especially along the passes and on land-slips; also found in the TONS valley, from Kálsi to Thadiár.

Wood reddish-brown, hard and close-grained; weight 47 lbs. per c. ft. It is used for building and agricultural implements.

Fl. Mar., Apr.

2. **W. puberula**, DC.; Fl. Br. Ind. iii. 37; Brandis For. Flora 576.

A small deciduous tree with rough brownish-grey bark; innovations puberulous. *Leaves* 4-8 by 2.5-4 in., elliptic or oblong, acute, less frequently acuminate, rather membranous, glabrous above except along the nerves, with brown pubescence along the midrib and nerves beneath; lateral nerves 10-12 pairs, less prominent than in the other species; base acute; petiole .3-.7 in. long; stipules .2-.3 in. long, usually caudate-acuminate, erect, persistent. *Flowers* sessile, very small, bluish-white, in terminal and axillary panicles which are generally shorter than the leaves. *Calyx* hairy; lobes triangular. *Corolla* funnel-shaped; lobes shorter than the tube. *Capsules* about .1 in. long, nearly glabrous.

Fairly common along banks of streams in the TONS valley JAUNSAE and TEHRI-GARHWAL, up to 4,000 ft.; Dhármigádh Thadiár, Sendrá, etc. Also Sansáru Khálsá, MÁLKOT.

Fl. May-June. Fr. Dec.-Jan.

5. **Randia**, Linn.; G. P. n. 166.

Shrubs or trees, often spinous. *Leaves* opposite or falsely alternate; stipules intrapetiolar, short. *Flowers*



45. RUBIACEÆ.

[*Randia*.

white, fading to yellow, solitary fascicled or corymbose, usually axillary. *Calyx-limb* tubular; lobes long or short. *Corolla-tube* usually cylindrical, long or short; lobes usually 5, twisted in bud. *Stamens* 5; anthers subsessile, narrow. *Ovary* generally 2-celled; ovules usually numerous, on fleshy placentas; style entire or bifid. *Fruit* a succulent berry, 2-celled, generally many-seeded; seeds angular.

Analysis of the Species.

- | | |
|--|----------------------------|
| A small shrub; fruit 3 in. long, 4-seeded | 1. <i>R. tetrasperma</i> . |
| Small trees; fruit 1-2 in. long, many-seeded. | |
| Spines short, at the ends of the branchlets; corolla glabrous outside. | 2. <i>R. uliginosa</i> . |
| Spines long, axillary; corolla hairy outside. | 3. <i>R. dumetorum</i> . |

1. ***R. tetrasperma***, Benth. & Hook. f.; Fl. Br. Ind. iii. 109; Brandis For. Flora 272; Gamble Man. Ind. Timb. 227. Vern. *Bhedrá*, *Dánwá*, *Chhotá Gingáru*, Jaunsar.

A small shrub with stiff grey branches and branchlets. *Leaves* crowded at the ends of the branchlets, 5-2 in. long, obovate or oblanceolate, narrowed into a short petiole, glabrous; stipules small. *Flowers* sessile, 4-6 in. across, greenish-white, fragrant. *Calyx-lobes* subulate. *Corolla-tube* 3 in. long; lobes oblong. *Anthers* exserted. *Stigma* long, spindle-shaped. *Berry* globose, 3-4 in. diam., 4-seeded.

JAUN SAR and TEHRI-GARHWAL, up to 5,000 feet: Tons valley from Maindrot to Mautárgádh. Common at Korwá. Also OUTER HIMALAYA; Málkót.

Wood white, very hard and tough; weight 56 lb. per c. ft.; straight branches can be made into walking-sticks.

Fl. Apr., May. Fr. Cold season.

2. ***R. uliginosa***, DC.; Fl. Br. Ind. iii. 110; Brandis For. Flora 273; Gamble Man. Ind. Timb. 226. Vern. *Pindálú*, *Pindár*, *Pindorá*, *Pendúá*, *Pendárá*, Hind.; *Pandárá*, Sahéranyur.

A rigid small tree with reddish-brown bark and quadrangular branches. *Leaves* approximate at the ends of the branchlets, 2-8 by 1-4 in., obovate or obovate-oblong from a cuneate base, shining above, often pubescent along the nerves beneath, the upper usually subtending a few 5 in. long sharp decussate weak spines. *Flowers* white, solitary, sessile or peduncled. *Calyx-tube* over 1 in. long; lobes rounded. *Corolla* large, 1-2 in. diam., showy; limb

spreading; mouth of the tube partially closed with a ring of white hairs in the sessile flowers. *Stigma* fusiform, often 2-lobed. *Fruit* ovoid, up to 2 in. long, with a thick hard pulp.

Likely to occur in swampy grass lands in the DÚN; common in wet lands in LOWER SAHÁRANPUR as at Pathri.

Wood whitish-grey, close-grained and hard; weight 48 lbs. per c. ft. The fruit is eaten, and the leaves are browsed by deer and cattle.

New leaves April. Fl. May, June. Fr. Cold season.

3. **R. dumetorum**, Lamk.; Fl. Br. Ind. iii. 110; Brandis For. Flora 273; Gamble Man. Ind. Timb. 227. Vern. *Maindal*, *Mainphal*, Hind.

A large deciduous shrub or small tree with grey bark, and often long and stout axillary spines. *Leaves* 1-2 in. long, obovate, obtuse or acute, narrowed into the short marginate petiole, glabrous or pubescent, or rough with stiff hairs; stipules ovate, acuminate. *Flowers* greenish or yellowish-white, fragrant, solitary or 2-3 together at the end of short lateral branchlets, shortly pedunculate. *Calyx* strigose; tube 2-3 in. long; lobes ovate, foliaceous, as long as the tube. *Corolla-lobes* spreading, oval up to the tips of the calyx-lobes, with adpressed white hairs; tube up to the tips of the calyx-lobes. *Fruit* a soft fleshy berry, 1-1.5 in. long, globose or ovoid, yellow, glabrous or pubescent; pericarp thick, leathery; seeds compressed, imbedded in a gelatinous pulp.

Extremely common throughout the DÚN and SAHÁRANPUR DIVISIONS, and also found in the Ámláwa and Tons valleys in JAUNSAIR. Affects the shade of Sál and other forest trees.

Wood light-brown or white, compact, hard,—used for agricultural implements, walking-sticks, fences and fuel. Weight 55-60 lbs. per c. ft. The leaves are lopped for fodder. The unripe fruit is used to poison fish, and is also eaten raw or roasted when ripe. The bark and the fruit are used in native medicine.

Fl. Apr.-June. Fr. Cold season.

6. *Gardenia*, Linn.; G. P. n. 167.

1. **G. turgida**, Roxb.; Fl. Br. Ind. iii. 118; Brandis For. Flora 270; Gamble Man. Ind. Timb. 228. Vern. *Thanelá*, Hind.

A small deciduous tree, armed with strong axillary often leaf-bearing spines; bark smooth, bluish-grey, mealy on branches. *Leaves* opposite, crowded at the ends of the branches, very variable in size, 1-4 in. long, obovate or elliptic, obtuse or short-acuminate, coriaceous, tomentose beneath, pubescent or glabrous and at length shining above.



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[*Gardenia*.]

sessile or narrowed into a short marginate petiole; stipules triangular, distinct, caducous. *Flowers* 1-4, about 1 in. long, fragrant, axillary or at the ends of short lateral branchlets. *Calyx* '15 in. long, subtruncate in male flowers, with oblong foliaceous lobes in female flowers. *Corolla* white; tube '3-5 in. long, slightly dilated upwards; lobes oblong, longer than the tube. *Stamens* as many as the corolla-lobes; anthers sessile, linear, included with only the tips slightly exerted, *Ovary* 1-celled; ovules numerous, inserted in 2 series on 2-6 parietal placentas. *Fruit* 2-3 in. long, pyriform, obovoid or globose, grey-mealy outside, furrowed at the base; pericarp thick, leathery; endocarp woody; seeds numerous, compressed, immersed in pulp.

Common throughout the SAHĀRANPUR SIWALIKS, especially near Ranipur, Dholkhand and Shāhjahānpur. Also found in certain localities in the DŪN, e.g., Lachiwāla, Nāgsidh, Timli, etc., but not quite so common.

Wood dirty-white, close-grained, fairly hard, weighing about 55 lbs. per c. ft. It splits and cracks in seasoning, and is scarcely used except for fuel. The fruit is eaten cooked in Central India, and is also used medicinally.

Fl. Mar., Apr. Fr. Cold season.

7. Pavetta, Linn.; G. P. n. 236.

1. *P. indica*, Linn.; Fl. Br. Ind. iii. 150. Syn.—*P. tomentosa*, Smith; Brandis For. Flora 275; Gamble Man. Ind. Timb. 231. Vern. *Angāri*, Dūn.

A large shrub with smooth brownish-grey bark. *Leaves* opposite, 3-9 by 1-3·5 in., elliptic, obovate or oblanceolate, obtuse, acute, acuminate or caudate, subcoriaceous, glabrous or tomentose; lateral nerves 10-15; petiole '5-1·5 in. long; stipules united into an intrapetiolar sheath, generally persistent. *Inflorescence* a terminal or sublateral, dense or lax, flat-topped corymb. *Flowers* white, fragrant; bracts broad, membranous. *Calyx* about '08 in. long, shortly-toothed. *Corolla* about 1 in.; tube long, very slender; lobes 4, oblong, twisted in bud, afterwards spreading and recurved. *Stamens* 4, on the mouth of the corolla-tube; filaments short. *Ovary* 2-celled; ovule solitary, attached to a prominent placenta; style filiform, twice as long as the corolla-tube; stigma slender, fusiform. *Berry* the size of a pea, with 2 plano-convex pyrenes; seeds peltate.

Var. *tomentosa*, Roxb., is characterised by having the inflorescence and leaves beneath pubescent or villous, and the corymbs sublateral (at the extremities of lateral often leafless branchlets) and long peduncled.

Common in moister parts of forest in the DÚN and the SIWALIK
 TRAIL: Tháno, Lachiwála, Mohkampur, Rámgarh, Ásárōri, etc.

Wood light-brown, hard and close-grained; weight 59 lbs. per
 c. ft.

Fl. Apr., May. Fr. Cold season.

8. Coffea, Linn.; G. P. n. 238.

C. bengalensis, Roxb.; Fl. Br. Ind. iii. 153; Brandis
 For. Flora 277; Gamble Man. Ind. Timb. 231.

A small deciduous shrub with slender spreading branches, and
 thin brownish-grey bark. *Leaves* opposite, about 5 by 3 in., ovate or
 elliptic, acuminate, membranous, glabrous, narrowed into a short
 petiole; stipules interpetiolar, broad, subulate, persistent. *Flowers*
 solitary or in pairs, axillary, white, fragrant, 1-1.5 in. across, ap-
 pearing before or with the leaves. *Calyx-tube* short, many-toothed.
Corolla funnel-shaped; tube 5-7 in. long; lobes ovate-oblong, slightly
 shorter than the tube, spreading or recurved, twisted in bud. *Stamens*
 inserted in the mouth of the corolla-tube; anthers subsessile, narrow.
Ovary 2-celled; ovules solitary, peltately attached to the dissep-
 iment; style bifid, filiform. *Fruit* a drupe, about 5 in. long, oblong,
 black, with 2 plano-convex pyrenes; seeds plano-convex, with a ventral
 groove; albumen horny.

Fairly common in shady ravines in the DÚN, and along the
 foot of the OUTER HIMALAYA: Bindál-nálá, Lachiwála, Rámgarh,
 Tháno, Nálápáni, Robbers' Cave, Mothronwála, etc.

The seeds are used as coffee in the Eastern Duára of Bengal.

Fl. Mar., Apl. Fr. June, July.

The real Coffee shrub, *C. arabica*, Linn.; Fl. Br. Ind. iii. 153—
 is cultivated as an ornamental garden plant in the DÚN. It is
 usually of a larger size than the above. *Flowers* numerous, in axillary
 fascicles. *Fruit* fleshy, purple when ripe.

9. Hamiltonia, Roxb.; G. P. n. 239.

H. suaveolens, Roxb.; Fl. Br. Ind. iii. 197; Brandis
 For. Flora 278; Gamble Man. Ind. Timb. 219. Vern. *Páderá*, Mál-
 kót; *Páderá*, Jaunsar.

A small shrub with divaricate branches. *Leaves* opposite,
 6-9 by 2-4 in., elliptic, oblong, or ovate, acute or acuminate, glabrous
 or pubescent, coriaceous, tough; main lateral nerves 10-15 pairs,
 arcuate, very prominent below; base acute; petiole 5-1 in.; stipules
 intrapetiolar, short, acute, persistent. *Flowers* sessile or shortly
 pedicelled, sweet-scented, but give an unpleasant smell when bruised,



club-shaped in bud; fascicled in large lax trichotomous panicles; fascicles subumbellate; bracts subulate. *Calyx-segments* 4-5, longer than the ovary, persistent. *Corolla-tube* .5 in. long, trumpet-shaped, pubescent. *Stamens* and *style* more or less exserted according to sex. *Capsules* ellipsoid, 1-1.5 in. long, 1-celled, 5-seeded; seeds triquetrous.

OUTER HIMALAYA, the DŪN and the SIWALIKS, also low hot valleys in JAUNSAIR; fairly common; a prevalent gregarious weed about Paléd, Málkôt and such other places.

The wood is used for making gun-powder charcoal in Chamba.

Fl. Oct.-Jan.

10. *Leptodermis*, Wall.; G. P. n 290.

1. *L. lanceolata*, Wall.; Fl. Br. Ind. iii. 198; Brandis For. Flora 279; Gamble Man. Ind. Timb. 232. Vern. *Páderá*, Jaunsar; *Páderá* or *Jogíá Páderá*, Garhwal and Kumaon.

A small shrub, generally gregarious on rocks; bark thin grey. *Leaves* opposite or whorled, very variable, .5-4 by .15-1.5 in.; ovate elliptic or elliptic-lanceolate, fetid when bruised; petiole .1-3 in. long. *Flowers* .5-.7 in. long, white, 4-6-merous, in bracteate heads which are disposed in large terminal panicles; bracteoles cuspidate, connate to form an involucre. *Calyx-tube* obconic; lobes 5, valvate, persistent. *Corolla* funnel-shaped, hairy within; lobes 5, valvate. *Stamens* 5, exserted in the male flowers. *Ovary* 5-celled; ovule 1 in each cell; style filiform, with 5 linear arms, exserted in the female flowers. *Capsules* 5-valved, each valve terminating in a persistent ciliate calyx-tooth; seeds with a membranous testa.

OUTER HIMALAYA and JAUNSAIR, 3-9,000 ft.: Sahansra-dhárá, Mussoorie, Konáin, etc. Wood hard, close-grained, white.

Fl. July-Sept. Fr. Nov.-Jan.

ORDER 46. COMPOSITÆ; G. P. N. 88.

Herbs or shrubs, rarely trees. *Leaves* exstipulate, alternate or opposite, simple or compound. *Inflor-escence* a bracteate head. *Flowers* numerous, small, sessile, all tubular, or the outer or all ligulate; all bisexual, or the inner male and the outer female or neuter, sometimes dioecious. *Calyx* superior; limb none, or of hairs or scales. *Corolla* either tubular or campanulate with 4-5 valvate lobes, or ligulate with strap-shaped elongated connate lobes. *Disk* epigynous. *Stamens* 4-5, usually



syngenesious, anthers basifixed; connective produced. Ovary inferior, 1-celled; ovule solitary; style slender, 2-fid, arms linear, often hairy. Fruit a dry achene usually crowned with the hairy calyx (pappus); seed exalbuminous; testa membranous.

With very few exceptions, all the species in this largest of all Orders are herbaceous, *Leucomeris*, described below, being the only tree Genus found within our limits.

1. *Leucomeris*, Don; G. P. n. 674.

1. *L. spectabilis*, Don; Fl. Br. Ind. iii. 386; Gamble Man. Ind. Timb. 232. Vern. *Phúsiári*, *Phúsára*, Hind.

A large shrub or small tree with white corky bark; branches stout, grooved. Leaves alternate, 4-14 by 1.5-4 in., narrow-oblong or oblanceolate, entire or minutely cuspidate-serrate, coriaceous, glabrous above, thickly white-felted beneath, narrowed into a marginate petiole .5-1 in. long; lateral nerves about 16 pairs. Heads .7-1 in. long, in globose thickly white-tomentose bracteolate corymbs. Flowers 4-8 in each head, all similar and fertile, about 1 in. long; segments narrow; bracts in many series. Involucre much shorter than the flowers. Corolla .5 in. long, tubular. Style 2-fid. Achenes about .2 in. long, 5-ribbed, slender, densely silky; pappus .5 in. long, rather rigid.

Fairly common in the OUTER HIMALAYA from Kálsi to Rikhi-kesh, 3,600 ft. Occasionally in the DÚN, e.g., at Buláwála.

The wood is brownish-white, fairly compact and even-grained, but the tree is generally hollow in the centre, rendering the wood useless.

Fl. cold season. Fr. Apr., May.

The following plants deserve notice—

1. *Vernonia Roxburghii*, Less.; Fl. Br. Ind. iii. 232. An undershrub common in blanks and grass lands near Lachiwála and elsewhere in the DÚN. Leaves alternate, subsessile or shortly petiolate, scabrid, cuspidate-serrate. Heads 30-flowered, sessile, in terminal corymbs. Achenes hairy; pappus whitish.—G. P. n. 16.

2. *Inula Cappa*, DC.; Fl. Br. Ind. iii. 295. An undershrub common in the OUTER HIMALAYA. Branches, inflorescence and underside of leaves silky-tomentose. Leaves alternate, oblong-lanceolate, shortly petiolate, distantly toothed, hairy or scabrid above. Heads small, very numerous, heterogamous. Achenes .05 in.; pappus .15 in., dirty yellowish-white; hairs thickened at the end.—G. P. n. 275.

3. *Inula cuspidata*, Clarke; Fl. Br. Ind. iii. 296. A glabrous undershrub with slender branches. *Leaves* 3-5 in., elliptic-lanceolate, serrulate, acuminate, pubescent when young. *Heads* numerous, in terminal corymbs. *Achenes* silky, .06 in.; pappus yellowish, hairs thickened at the tip. JAUNSAI and OUTER HIMALAYA, up to 6,000 ft.

4. *Artemisia vulgaris*, Linn.; Fl. Br. Ind. iii. 325; Vern. *Sámri*, Dún. A gregarious weed in gardens and camping grounds in the Dún, and sunny slopes in the HILLS, aromatic and shrub-like. *Leaves* large, ovate, lobed or lacinate, tomentose beneath. *Heads* .15-.2 in., in large paniced racemes.—G. P. n. 551.

5. *Echinops echinatus*; DC.; Fl. Br. Ind. iii. 358. Vern. *Gokhrá*, Hind. A thistle-like herb with white felt, common in fallow lands in the Dún. *Leaves* alternate, pinnatifid, spinous, thickly white-felted beneath. *Heads* 1-flowered, crowded in a globose white ball 2-3 in. across. *Achenes* obovate, silky.—G. P. n. 621.

6. *Catamixis baccharoides*, Thoms.; Fl. Br. Ind. iii. 389. An undershrub 3-5 ft. high, found in sandy cliffs in the SIWALIK-TRACT, e.g., Timli Pass, Beribará, etc. *Leaves* alternate, 2-3 by 1-1.5 in., obovate, distantly crenate above the middle, coriaceous; petiole very short, half-amplexicaul. *Heads* yellow, small, in broad terminal corymbs. *Corolla* .2 in. long, ligulate. *Achenes* turbinate, silky-villous; pappus .3 in. long, white. Fl. Dec., Jan.—G. P. n. 688.

7. *Gerbera lanuginosa*, Benth.; Fl. Br. Ind. iii. 390. Vern. *Kápherá*, Jaunsar; *Jhúlá*, *Jhílú*, *Kapás*, Garh. A scape-bearing small herb with lyrate pinnatifid or lobed radical leaves thickly felted below. *Scape* 4-12 in. long, cottony. *Heads* 1-1.5 in. across, hemispherical. *Achenes* ribbed. The cotton obtained from the leaves is used by the JAUNSAIS as tinder for their *chuck muca*, and occasionally made into coarse cloth or bags.—G. P. n. 699.

ORDER 47. ERICACEÆ; G. P. N. 93.

Shrubs or trees, rarely herbs. *Leaves* usually alternate, simple, exstipulate. *Flowers* solitary fascicled or racemed, usually regular, sometimes dimorphous. *Calyx* usually free; lobes 5, rarely 4 or 6. *Corolla* hypogynous, campanulate or urceolate. *Stamens* generally twice as many as the corolla-lobes, hypogynous or epipetalous; filaments free; anthers 2-celled, opening at the top by pores or slits, rarely longitudinally. *Ovary* superior, 4-5-many-celled; ovules many in the inner angles of the



cells; style cylindrical; stigma entire or obscurely lobed.
Fruit a 5-valved capsule; seeds very small, albuminous.

Analysis of the Genera.

- Flowers in racemes; capsules globose, loculicidally dehiscent. 1. *PIERIS*.
Flowers fascicled or subcorymbose; capsules elongate, septicidally dehiscent. 2. *RHODODENDRON*.

1. *Pieris*, D. Don; G. P. n. 17.

1. *P. ovalifolia*, D. Don; Fl. Br. Ind. iii, 460; Gamble Man. Ind. Timb. 235. Syn. *Andromeda ovalifolia*, Wall.; Brandis, For. Flora 280. Vern. *Āyār*, *Āngār*, Jaunsar.

A small deciduous tree; bark brown, peeling off in narrow strips, often deeply furrowed with spiral clefts. *Leaves* 3-6 in. long, ovate or elliptic-oblong, acute or acuminate, entire, rounded at the base, coriaceous, glabrous, often pilose beneath when young; petiole .2-5 in. *Inflorescence* a simple raceme, rarely falsely paniced; bracts lanceolate or linear, deciduous. *Flowers* white. *Calya-lobes* 5, triangular-lanceolate, .10-12 in., connate at the base. *Corolla* .2-4 in. long, elongate-ovoid, pubescent without; lobes 5, short, recurved. *Stamens* 10; filaments subulate, ciliate, with two filiform appendages at the apex. *Ovary* 5-celled, ovules many in each cell. *Capsules* .2 in. diam., globose, loculicidally 5-valved; seeds many, minute, linear-oblong.

Common in JAUNSAE, between 4,000 and 8,000 ft., always associated with *Quercus incana* and *Rhododendron arboreum*.

Wood light, reddish-brown, moderately compact and hard, but not durable and warps and shrinks badly in seasoning; weight 41 lbs. per c. ft. It is used only for fuel and charcoal, but even as fuel it is not considered good, as it does not burn well but only smoulders. The leaves are poisonous to goats and camels; they are used to kill insects, and an infusion of them is applied in skin diseases.

Fl. Apr.-June according to elevation. Fr. July-Sept.

2. *Rhododendron*, Linn.; G. P. n. 46.

Trees or shrubs. *Leaves* alternate or falsely whorled, often clustered at the ends of the branches, entire, coriaceous, edges often slightly recurved. *Flowers* usually in compact terminal clusters or in umbelliform corymbs.



rarely solitary; buds enclosed in scaly bracts. *Calyx* 5-lobed, sometimes obsolete. *Corolla* campanulate or funnel-shaped; lobes 5-10. *Stamens* usually 10, rarely 5 or 20; anthers dehiscing by terminal pores. *Ovary* 5-20-celled; ovules many in each cell. *Capsules* septically 4-20-valved from the apex; seeds very numerous, scale-like, albuminous.

Analysis of the Species.

Trees or large shrubs; calyx small or obsolete;
(flowers in terminal corymbs).

Leaves silvery or rusty-tomentose beneath;
pedicels 0 or very short; ovary woolly. 1. *R. arboreum*.

Leaves cinnamonous-tomentose beneath;
pedicels long; ovary glabrate. 2. *R. campanulatum*.

Small shrubs; calyx prominently lobed, lobes
long, foliaceous.

Flowers solitary or 2-3 together; peduncles
long, scabrous; leaves subsessile. 3. *R. lepidotum*.

Flowers in terminal corymbs; pedicels
short, glabrous; leaves petiolate. 4. *R. Anthopogon*.

1. ***R. arboreum***, Sm.; Fl. Br. Ind. iii. 465; Brandis For. Flora 281; Gamble Man. Ind. Timb. 236. The Tree-Rhododendron. Vern. *Burāns*, Jaunsar.

A small evergreen tree; bark reddish-brown, peeling off in small flakes. *Leaves* crowded at the ends of the branches, 4-6 in. long, lanceolate or elliptic-oblong, acute at both ends, coriaceous, glabrous above, rusty-tomentose or covered with small silvery scales beneath; nerves and midrib prominent beneath, depressed above; buds viscous. *Flowers* large, very showy, commonly deep-crimson, rarely pink or nearly white, in corymbose fascicles at the ends of the branches; pedicels 0 to one-third the length of the corolla-tube; bracts hairy. *Calyx-lobes* 1 in. wide, ovate, or very obscure. *Corolla* campanulate, 1-1.5 by .8-1 in.; lobes 5, often unequal. *Stamens* 10, alternately longer. *Ovary* woolly, 7-9-celled. *Capsules* 1 in. long, cylindrical, curved, longitudinally ribbed; seeds ellipsoid.

Common in JAUNSAAR and TEHRI-GARHWAL, between 4,000 and 8,000 ft., almost always associated with *Pieris ovalifolia* and *Quercus incana*.

Wood soft, brownish or reddish-white, close- and even-grained, seasons badly, and is apt to warp and shrink; weight 40-45 lbs. per c. ft.



It is chiefly used for fuel and charcoal, but is sometimes locally used for building, for making dishes, gun-stocks, tool-handles, etc. The flowers are eaten and are made into preserves. They are offered in temples in the hills, and are applied in headaches. The viscid tender leaves are eaten cooked as a vegetable.

Fl. Usually Mar.-May. Fr. Autumn and cold season.

2. *R. campanulatum*, Don; Fl. Br. Ind. iii. 466; Brandis For. Flora 281; Gamble Man. Ind. Timb. 237. Vern. *Simris*, T.-Garh.

A moderate-sized evergreen shrub with thin grey bark. *Leaves* 3-5 in. long, elliptic or elliptic-oblong, rounded at both ends, crowded at the ends of the branches, mucronate, coriaceous, glabrous and finely reticulate above, with a dense cinnamon-colour tomentum concealing the nerves beneath; midrib prominent. *Flowers* large and showy, whitish-pink, purple or lilac, in lax terminal corymbs; pedicels as long as the corolla-tube; bracts silky. *Calyx-teeth* broadly triangular, very small. *Corolla* campanulate, 1-1.5 by .8-1 in.; lobes 5. *Stamens* 10. *Ovary* 5-9-celled, glabrous; style persistent. *Capsules* cylindrical, about 1 in. long, more or less curved; seeds linear-oblong, compressed.

TEHRI-GARHWAL, above 10,000 ft.: Rikhshin, Kedār Kántā Chánsil, etc.

Wood light pinkish-red, close-grained and moderately hard; weight about 40 lbs. per c. ft. "The leaves are brought to the plains and used as snuff."—*Sir D. Brandis*.

Fl. May-July. Fr. Oct.-Dec.

3. *R. lepidotum*, Wall.; Fl. Br. Ind. iii. 471; Brandis For. Flora 282; Gamble Man. Ind. Timb. 236. Vern. *Simris*, T.-Garh.

A small aromatic shrub; young parts covered with glandular scales. *Leaves* .7-1 in. long, approximate at the ends of the branches, sessile or subsessile, obovate and obtuse, or lanceolate and subacute, glabrous above, silvery- or brown-tomentose beneath. *Flowers* red, yellow or purple, solitary or 2-3 together; pedicels .5-1.5 in. long, very scabrous. *Calyx-lobes* oval, not ciliate. *Corolla-tube* short; lobes round, spreading, .2-3 in. long. *Stamens* usually 8. *Ovary* 5-celled. *Capsules* 5-celled, .3 by .2 in.; seeds oblong, acute.

TEHRI-GARHWAL, 9, 11,000 ft., usually on rocks.: Chánsil, Gangottari, etc.

"The leaves of this and the preceding species are used as stimulants in native medicine" (*Sir D. Brandis*) under the name *Tálisfar*(?) or *Tálispat*.

Fl. June, July.

4. **R. Anthopogon**, Don; Fl. Br. Ind. iii. 472; Brandis For. Flora 282; Gamble Man. Ind. Timb. 235. Vern. *Tális, Tálisri*, Punjab hills.

A small shrub with an aromatic odour; branchlets scabrous and scaly. *Leaves* 1-1.5 in. long, elliptic or broad-oblong, shining above, brown-tomentose beneath; petiole .12-.25 in. long. *Flowers* yellow, in dense terminal corymbs. *Calyx-lobes* oblong or elliptic, membranous, ciliate. *Corolla* tubular with a dilated mouth; tube .2 in. long; lobes obovate, entire, spreading. *Stamens* 6-8. *Ovary* scaly. *Capsules* .2 in long, ovoid; seeds oblong, subacute.

TEHRI-GARHWAL, above 11,000 ft.: Chur, Kedār Kānta, Harkī Dūn, etc. Gregarious and generally under the equally gregarious *Betula utilis*.

Fl. June, July.

ORDER 48. MYRSINÆ; G. P. N. 100.

Shrubs or small trees. *Leaves* alternate, simple, exstipulate, generally gland-dotted. *Flowers* small, regular, in axillary clusters racemes or panicles, rarely terminal. *Calyx* free, exceptionally adhering to the ovary; lobes persistent, sometimes accrescent in fruit. *Corolla* regular; petals connate or free, contorted or imbricate. *Stamens* epipetalous, as many as the petals or corolla-lobes; anthers oblong, free or united by their margins. *Ovary* 1-celled; ovules few or many, inserted on a free-central placenta; style filiform or columnar. *Fruit* a berry or drupe, often coloured; seeds excavate at the base.

Analysis of the Genera.

- | | |
|---|-------------|
| Calyx adnate to the ovary; fruit many-seeded . . . | 1. MESA. |
| Calyx free; fruit 1-seeded. | |
| Petals free; flowers racemed or paniced . . . | 3. EMBELIA. |
| Petals united into a short tube. | |
| Fls. in dense axillary clusters; corolla imbricate . . . | 2. MYRSINE. |
| Fls. in umbels racemes or corymbs; corolla twisted to the right | 4. ARDISIA. |

1. *Mæsa*, Forsk.; G. P. n. 1.

1. *M. indica*, Wall.; Fl. Br. Ind. iii. 509; Brandis For. Flora 283; Gamble Man. Ind. Timb. 238.

A large shrub with long straggling branches. *Leaves* 3-5 by 1-1.5 in., lanceolate or elliptic-oblong, distantly sharp-toothed, subcoriaceous or membranous; primary nerves 5-9 pairs; petiole about .5 in. *Flowers* white, small, in compound racemes; bracts minute. *Calyx-tube* more or less adnate to the ovary; lobes 5, obtuse, pubescent, persistent. *Corolla* gamopetalous, white, 5-lobed, twice the size of the calyx. *Stamens* 5; filaments short; anthers broad. *Fruit* a globose berry, about .15 in. across, crowned with the persistent calyx-lobes and often tipped by the remains of the style, fleshy juicy and pinkish-white when ripe.

Common in the SUB-HIMALAYAN HILLS: Paléd, Sansarú Khálá, Mussoorie, etc.

The berries are eaten in Nepal, and the leaves are used to poison fish in Canara.

Fl. Dec.-Apr. and sometimes also in the rains. Fr. Cold season.

2. *Myrsine*, Linn.; G. P. n. 2.

Shrubs or small trees. *Leaves* entire or serrate, usually coriaceous. *Flowers* polygamous or dicecious, fascicled usually at the axils of fallen leaves; bracts densely imbricate. *Calyx* 4-5-lobed, persistent. *Corolla* 4-5-partite; segments imbricate, recurved. *Stamens* 4-5. *Ovary* superior, globose; ovules many; style short, cylindrical. *Fruit* small, globose, red or purple; seed solitary.

Analysis of the Species.

A small shrub with pubescent branchlets; leaves small, subsessile.

1. *M. africana*.

A small glabrous tree; leaves usually large, petiolate.

2. *M. semiserrata*.

1. *M. africana*, Linn.; Fl. Br. Ind. iii. 511; Brandis For. Flora 286; Gamble Man. Ind. Timb. 239. Vern. *Banwán*, Jaunsar; *Rikháulmi*, Garhwal.

A small evergreen shrub; branchlets and petioles ferruginous-pubescent. *Leaves* 5-1.5 by .8-5 in., lanceolate or obovate, sharply



cuspidate-serrate; midrib prominent; petiole minute. *Flowers* small, subsessile, tetrandrous, in axillary fascicles of 4-6. *Anthers* exceeding the corolla. *Style* short; stigma flat. *Drupe*s usually solitary, red, smooth, 1 in. diam.

Common in JAUNSAK and in the OUTER HIMALAYA, 3,900 ft.

The fruit is used in native medicine as an anthelmintic under the name of *Bebrang*.

Fl. Mar.-May. Fr. Apr.-May to Nov.-Dec.

2. *M. semiserrata*, Wall.; Fl. Br. Ind. iii. 511; Brandis For. Flora 285; Gamble Man. Ind. Timb. 239. Vern. *Bains*, *Gaunta*, Garhwal.

A shrub or small tree with ash-coloured bark. *Leaves* 2.5 by 1.2 in., lanceolate, acute, entire or sparingly cuspidate-serrate towards the apex, coriaceous, gland-dotted, glabrous; petiole 1-3 in. long. *Flowers* 1 in. diam., in dense axillary fascicles; pedicels 2-3 in. long, glabrous. *Calyx* persistent, half the length of the corolla-lobes. *Style* short. *Drupe* the size of a small pea, generally clustered, globose, red, shining; seed solitary, globose.

OUTER HIMALAYAN RANGES and valleys in JAUNSAK and TEHRI-GARHWAL up to 6,000 ft.: Sansarú Khálá, Mussoorie, Korwá, Chakrata, Dhárágádh, etc.

Wood compact, heavy, hard and handsome, and said to be esteemed in Nepal for carpenter's work; weight 50 lbs. per c. ft.

Fl. and fr. Cold season.

3. *Embelia*, Burm.; G. P. n. 8 (Samara).

1. *E. robusta*, Roxb.; Fl. Br. Ind. iii. 515; Brandis For. Flora 284; Gamble Man. Ind. Timb. 240. Vern. *Gáíá*, Dún.

A large shrub or small tree; bark brown, with horizontal cracks and numerous lenticels on the branches. *Leaves* 5-7 by 2.3-2 in., obovate-oblong elliptic or oblanceolate, short-acuminate, undulate, sometimes obscurely serrulate, usually rusty-pubescent beneath; lateral nerves 6-12 pairs, prominent, arcuate; base cuneate; petiole glandular, usually channelled. *Flowers* small, mostly dioecious, in axillary and terminal simple or fascicled racemes. *Calyx* free, deeply 5-lobed, persistent. *Petals* 5, oblong, reflexed, puberulous. *Stamens* 5, adnate to the petals. *Ovary* superior, globose; ovules few, embedded in a fleshy placenta; style short, persistent. *Fruit* a dry berry, globose, red, more or less longitudinally ribbed, crowned with the remains of the style; seed usually solitary, globose, with a hollowed base.

Common in the DÚN and SAHÁRANPUR FORESTS: Lachiwála, Pardúni, Dharmáwála, Mohkumpur, etc.

The fruit has the same native name and economic use as that of *Myrsine africana*.

Fl. July-Sept. Fr. Cold season.

4. *Ardisia*, Swartz.; G. P. n. 12.

1. *A. humilis*, Vahl; Fl. Br. Ind. iii. 529; Brandis For. Flora 287; Gamble Man. Ind. Timb. 240.

A large glabrous shrub. *Leaves* 4-8 by 1.5-3.5 in., obovate oblong or elliptic, acute or short-acuminate, entire, coriaceous, fleshy; lateral nerves not very conspicuous; base cuneate; petiole marginate. *Flowers* 2-sexual, rose-coloured or pinkish-white, about .5 in. across, in axillary corymbose racemes; pedicels 1-2 in. long in the fruit, somewhat shorter in flower; bracts deciduous. *Calyx-lobes* 5, obtuse, oval or rounded, slightly enlarged in fruit. *Corolla* deeply 5-lobed; segments acute, twisted to the right in bud. *Stamens* 5; filaments short; anthers acute. *Ovary* free, 1-celled, tapering; style long, persistent. *Fruit* globose, the size of a large pea, black when fully ripe, full of a pink juice.

Fairly common in the damper parts of the DÚN FORESTS, especially along shady ravines.

Wood soft, used only for fuel.

Fl. in all seasons, but chiefly Mar., Apr. Fr. generally cold season.

ORDER 49. SAPOTACEÆ; G. P. N. 101.

Trees or shrubs, often with milky juice. *Leaves* alternate, simple, entire, coriaceous, generally exstipulate. *Flowers* bisexual, axillary, solitary or clustered; bracts minute or none. *Calyx-lobes* 4-8 and imbricate, or multiseriate with the outer series valvate. *Corolla-tube* short; lobes as many, or 2-4 times as many, as the calyx-lobes. *Stamens* upon the corolla-tube, as many as the corolla-lobes or as the lobes of the inner series and opposite to them, or numerous in 1-3 series, sometimes alternating with staminodes; filaments short; connective often produced. *Ovary* superior, 2-8-celled; cells 1-ovuled. *Fruit* a drupe or berry. *Seeds* 1-8,



ellipsoid, often compressed, exalbuminous and with large fleshy cotyledons, or albuminous and with flat cotyledons; testa usually crustaceous.

1. *Bassia*, Linn.; G. P. n. 14.

Trees with milky juice. *Leaves* stipulate; stipules caducous. *Flowers* on axillary, generally fasciculate, pedicels. *Calyx* deeply 4-8-lobed; lobes biseriate, the outer lobes valvate, the inner sub-imbricate, in bud. *Corolla-tube* ovoid or campanulate; lobes 5-14, contorted in bud. *Stamens* at least twice as many as the corolla-lobes, all fertile; anthers cordate, acute, with a mucronate connective. *Ovary* villous, usually 6-8-celled; style long-exserted, persistent. *Fruit* an oblong or globose berry, 1-3-seeded, exalbuminous; cotyledons fleshy, oily.

Analysis of the Species.

Corolla-tube fleshy, lobes erect; anthers not exserted. 1. *B. latifolia*.
Corolla-tube not fleshy, lobes spreading; anthers
exserted. 2. *B. butyracea*.

1. *B. latifolia*, Roxb.; Fl. Br. Ind. iii. 544; Brandis For. Flora 289; Gamble Man. Ind. Timb. 243. Vern. *Mauwá*, *Mahuá* or *Mohwá*, Hind.

A large deciduous tree; young parts pubescent; bark grey or blackish with shallow wrinkles and vertical cracks. *Leaves* clustered at the ends of the branches, 5-7 by 3-4 in., elliptic or oblong-elliptic, short acuminate or obtuse, coriaceous, densely woolly beneath when young, glabrescent afterwards; main lateral nerves 10-12 pairs; base cuneate; petiole 1-1.5 in.; stipules subulate. *Flowers* numerous at the ends of the branches, on drooping woolly pedicels, 1-1.5 in. long. *Calyx* coriaceous, densely rusty-tomentose; lobes 4, rarely 5. *Corolla* 6-8 in. long, fleshy and juicy, cream-coloured, early caducous; tube ovoid; lobes 7-14, usually 8-9, short, erect. *Stamens* generally 24-26; anthers hairy at the back, subsessile, inserted in 3 series inside the corolla-tube. *Berry* ovoid, fleshy, green, 1-2 in. long, 1-4-seeded.

Not very common in the SCHOOL CIRCLE. Occurs sporadically at Kálsi in JAUNSAK, at Dúdhli, Phándowála and Sáinköt in the Dén, and about Beribára in the SAHÁRANPUR DIVISION.

Heartwood scanty, reddish-brown, very hard, close- and even-grained, tough and durable, and seasons well; weight about 65 lbs. per c. ft. But the tree is so much prized for its flower and fruit that it is rarely felled. The flowers are eaten raw or cooked, or made into sweetmeats. A coarse and strong spirit is also distilled from them. The fruit is eaten and gives, when expressed, a thick oil which is eaten, burned in *chirāghs*, and is also used to adulterate ghee. The oil-cake is used to poison fish.

Leafless Feb.-Apr. Fl. Mar., Apr. Fr. June, July.

2. **B. butyracea**, Roxb.; Fl. Br. Ind. iii. 546; Brandis, For. Flora 290; Gamble Man. Ind. Timb. 244. Vern. *Chiura*; Dñ; *Phalwārā*, *Phulel*, *Phulōā*, Hind.

A large deciduous tree with dark-grey bark. *Leaves* 6-12 by 4-7 in., obovate or obovate-oblong, coriaceous, soft-tomentose beneath crowded near the ends of the branches; lateral nerves 15-20 pairs; base rhomboid; petiole 1-1.5 in. long; stipules minute, caducous. *Flowers* on drooping tomentose pedicels 1-1.3 in. long, crowded below the terminal leaves in the axils of the lower ones. *Calyx* coriaceous, rusty-tomentose, deeply 5-cleft: lobes 3-5 in. long. *Corolla* pale-yellow; tube .7 in. long, cylindrical, not fleshy; lobes 8-10, spreading. *Stamens* 30-40; anthers exserted, not hairy. *Berry* ovoid, smooth, 1 in. long, 1-3-seeded.

It has only been found at Tapoban in the EASTERN Dñ, and may possibly be found in the inner hills of TEHRI-GARHWAL.

The tree is valued for its fruit, from the seeds of which a vegetable butter is extracted. It makes good soap, and made into candles is said to burn without smoke or unpleasant smell. It is used for headache and as an external application for rheumatism. The oil-cake, as also the pulp of the fruit, is eaten.

Fl. Nov.-Jan. Fr. June, July.

To this Family belong the following which are cultivated in gardens in SAHÁRANPUR and the Dñ:—

Mimusops Elengi, Linn.; Fl. Br. Ind. iii. 548. Vern. *Maulsāri*, Hind.—the fragrant flowers of which are used in native perfumery.—G. P. n. 22.

Also *Mimusops hexandra*, Roxb.; Fl. Br. Ind. iii. 549, Vern. *Khirmi*, Hind.—noted for its edible fruit and useful timber.

ORDER 50. EBENACEÆ; G. P. N. 102.

Trees or shrubs. *Leaves* alternate, entire, exstipulate. *Flowers* axillary, regular, usually dicecious, generally



bracteate, solitary or in small cymes. *Calyx* inferior, gamosepalous, often accrescent in fruit. *Corolla* gamopetalous. *Stamens* as many, or 2-3 times as many, as the corolla-lobes, free or variously united, absent or rudimentary in the female flowers; anthers linear, erect, with the connective usually prolonged beyond them. *Ovary* superior, 2- or more-celled, with usually one pendulous ovule in each cell; styles 2-8, distinct or connate at the base. *Fruit* an indehiscent, coriaceous or fleshy berry; seeds few, pendulous, albuminous; cotyledons foliaceous.

1. *Diospyros*, Linn.; G. P. n. 4.

Trees, rarely shrubs. *Leaves* alternate, sometimes subopposite, entire. *Flowers* diœcious, rarely polygamous, the female often solitary. *Calyx* lobed; lobes often accrescent in fruit. *Corolla* tubular or urceolate, deeply lobed; lobes twisted to the right. MALE FLOWERS: *Stamens* 4-16 or more; ovary rudimentary. FEMALE FLOWERS: *Staminodes* 0-16. *Ovary* usually 4-5-celled; ovules solitary in each cell. *Fruit* generally pulpy, 1-10-seeded. *Seeds* usually compressed; albumen uniform or ruminated.

Analysis of the Species.

Leaves always alternate, oblong.

Leaves soft, pubescent; fruit glabrous . . . 1. *D. montana*.

Leaves hard, glabrous; fruit densely rusty. . . 2. *D. hirtiroptera*.

Leaves alternate or subopposite, broad-ovate . . . 3. *D. tomentosa*.

1. *D. montana*, Roxb.; Fl. Br. Ind. iii. 555; Brandis For. Flora 296; Gamble Man. Ind. Timb. 251. Vern. *Bis Tendú*, Hind.; *Chambér*, Saháranpur.

A large shrub with a short trunk and a broad rounded dense crown, often spinescent. Bark thin smooth pinkish or bluish-grey on branches, dark-grey or almost black and deeply cracked on old

stems. *Leaves* 2-4 by 1-1.5 in., ovate or oblong, soft, membranous or subcoriaceous, light-green, pubescent or glabrescent; nerves slender; base cordate rounded or cuneate; petiole .2 in. or less. **MALE FLOWERS** in bracteate cymes. *Calyx* 4-cleft; lobes ovate. *Corolla* urceolate, with 4 short lobes. *Stamens* 16, in two series, glabrous. **FEMALE FLOWERS** solitary, nodding, larger than the male flowers; pedicels with a pair of bracts at the apex. *Calyx* deeply 4-fid; lobes ovate. *Staminodes* 4-12 in one series. *Ovary* glabrous, 8-celled, 1 ovule in each cell. *Fruit* globose, .5-1.2 in. diam., yellow when ripe, supported by the accrescent leathery calyx.

Common in the lower SAHÁRANPUR FORESTS and also found occasionally in the DÚN, e.g., Tháno, Lachiwála.

The wood is hard and durable and is variegated with black and white streaks. It would perhaps be good for furniture, but at present there is no demand except for fuel. Heartwood not distinct, weight about 45 lbs. per c. ft. Every part of the tree, including the fruit, is bitter and has an unpleasant smell.

Fl. Mar.-May. Fr. Cold season.

There is a tree occasionally met with in the SAHÁRANPUR and DÚN DIVISIONS, e.g., at Bádsháhibágh, Mohand, Dholkhand, Ránipur, Lachiwála, Tháno, etc., which differs from *D. montana*, as described above in the following respects:—*Trunk* fairly long; *crown* rather narrow and open; *branchlets* not spinescent; *bark* greenish-grey, always smooth, exfoliating in thin scales; *leaves* not bitter, larger, 3-5 by 1.5-2 in., oblong or elliptic, subcoriaceous, brittle, pubescent, or glabrescent, midrib impressed above, prominent beneath. The flower has not been seen, but the fruit is exactly like that of *D. montana*. Except for the smooth bark and the absence of spines, this might be var. *cordifolia*, Roxb. Is it a new species?

2. **D. Embryopteris**, Pers.; Fl. Br. Ind. iii. 556; Brandis For. Flora 298; Gamble Man. Ind. Timb. 252. Vern. *Gáb, Kálá Tendú*, Hind.

A middle-sized evergreen tree, with dark-green shining foliage, and dark-grey or greenish-black bark. *Leaves* distichous, 5-8 by 1.5-2 in., oblong, subacute, coriaceous, smooth, shining; base obtuse; petiole wrinkled, .5 in. long. *Flowers* tetramerous, scented, white or cream-coloured. **MALE FLOWERS** in short pedunculate cymes of 3-6 flowers. *Stamens* many, hairy. **FEMALE FLOWERS** 1-5 together, subsessile, larger than the male flowers. *Staminodes* 1-12. *Ovary* 8-celled; styles 4, lobed at the tips. *Fruit* subglobose, 1.5-2 in. diam., glandular or rusty, supported on the much-acrescent calyx, yellow when ripe. *seeds* 5-8, compressed, embedded in a glutinous pulp often rudimentary under cultivation.



Found in the DŪN in moist shady localities, e.g., Khairi forest, Jogiwāla, Āmbāri, etc. Also in ravines in the Kālsi forest. Cultivated in DEHRA.

Wood white, moderately hard and close-grained, used for building. Heartwood not distinct, weight 52 lbs. per c. ft. Round the seeds of the ripe fruit, filling the cells, is a honey-like sweet substance which is eaten. The same substance in the unripe fruit is used as gum in book-binding, and in place of tar for paying the seams of country boats. An infusion of the pulp of unripe fruit is used to render fishing nets and lines durable. The extract of the fruit is used in medicine as an astringent. The oil extracted from the seeds is also used in native medicine.

Fl. June-Aug. Fr. Apr., May.

3. *D. tomentosa*, Roxb.; Fl. Br. Ind. iii. 564. Syn.—*D. Melanoxylon*, Roxb.; Brandis For. Flora 294; Gamble Man. Ind. Timb. 249. Vern. *Tendū*, Hind.

A moderate-sized tree with greyish-black bark, exfoliating in regular rectangular scales; young parts covered with grey or rusty tomentum. *Leaves* alternate and subopposite, 3-6 by 2-5 in., broad-ovate, very coriaceous, hairy when young, glabrous above when mature, ultimately glabrescent below; secondary nerves 6-10 pairs, impressed as broad furrows on the upper surface; base cordate or rounded, rarely cuneate; petiole 3-5 in. long. MALE FLOWERS subsessile in short drooping cymes. *Calyx* funnel-shaped. *Stamens* 12-16, free. FEMALE FLOWERS solitary, larger than the male flowers. *Calyx* 4-5-gonal. *Staminodes* 8-10 or fewer, sometimes connate in pairs. *Ovary* hairy, 4-8-celled; styles 2-3. *Fruit* globose, 1-1.5 in. across, glabrous, smooth, yellow when ripe; pulp yellow, sweet. *Seeds* 4-8, compressed, oblong; albumen ruminated.

Common in the western half of SAHĀBANPUR SIWALIKS. Occasionally found in the W. DŪN SIWALIKS.

Wood hard, of a whitish-pink colour, tough and fairly durable, used for building, shoulder-poles, mine-props and shafts of carriages. In some trees irregular masses of black ebony is found, which is very heavy, weighing 75-80 lbs. per c. ft. and is used for carving and other ornamental work. The ripe fruit is edible. The tree coppices very well, and throws out vigorous root-suckers.

Fl. May, June. Fr. Apr. and May, next year.

ORDER 51. STYRACEÆ; G. P. N. 103.

Trees or shrubs. *Leaves* alternate, simple, exstipulate. *Flowers* hermaphrodite, regular, usually white.

Calyx-tube more or less adnate to the ovary; limb 4-5-toothed or truncate, persistent. *Petals* 4-5, united into a short tube or almost free. *Stamens* usually indefinite, attached to the corolla-tube in one or more series. *Ovary* inferior or superior, 2-5-celled, with 2 or more ovules in each cell. *Style* undivided, filiform; stigma small or capitate. *Fruit* drupaceous, usually 1-seeded. *Seeds* albuminous.

1. *Symplocos*, Linn.; G. P. n. 1.

1. *S. cratægoides*, Ham.; Fl. Br. Ind. iii, 573; Brandis For. Flora 299; Gamble Man. Ind. Timb. 253. Vern. *Lodh*, *Lodra*, *Jaunsar*; Sans. *Lodhra*.

A large shrub or small tree; bark light-grey, corky, with long vertical furrows. *Leaves* 2-4 by 1-1.5 in., broad-elliptic or ovate, acuminate, sharply glandular-serrulate towards the apex, membranous, pilose beneath or glabrescent. *Flowers* white, 2 in. diam., fragrant, in cymose corymbs forming dense terminal or axillary panicles; bracts, caducous. *Calyx* turbinate, lobes ciliate. *Corolla* 5-cleft nearly to the base. *Stamens* indefinite, connate in 5 bundles. *Ovary* inferior, 2-celled. *Fruit* 12-3 in. long, obliquely ovoid or obovoid, crowned with the remains of the calyx-limb, usually 1-seeded.

JAUNSAI, TEHRI-GARHWAL, and the OUTER HIMALAYA, 3-9,000 ft., e.g., Deoban, Lokhár, Bagúr Block (Kathián), Tons valley, Mautárgádh, Lúnárgádh, Laduákót, etc.

Wood white, hard and close-grained, but warps and splits in seasoning; weight 45-54 lbs. per c. ft. It is, however, fairly durable and has been recommended for turning, and would do even for carving if properly seasoned. The leaves and bark give a yellow dye, the former being also lopped for fodder.

Fl. and new leaves May, June. Fr. July-Oct.

ORDER 52. OLEACEÆ; G. P. N. 104.

Erect or scandent shrubs, or trees. *Leaves* opposite (except in *Jasminum humile*), simple 3-foliolate or imparipinnate, exstipulate. *Flowers* regular, in axillary



or terminal cymose panicles, rarely solitary. *Calyx* free; limb 4-5- or more-toothed or -lobed, sometimes truncate, rarely 0. *Corolla* gamopetalous; lobes 4-5 or more or none, imbricate or valvate in bud; tube narrow. *Stamens* 2, inserted on, and included in, the corolla-tube; filaments usually very short. *Ovary* free, 2-celled, with usually 1-2 ovules in each cell; style simple, long or short; stigma simple or 2-lobed. *Fruit* succulent or dry, berry-like, capsular or drupaceous; seeds 1 or 2 in each cell, erect or pendulous; albumen fleshy or horny, or 0.

Analysis of the Genera.

Corolla-lobes much imbricate.

Scandent shrubs; fruit a berry 1. JASMINUM.

Erect small tree; fruit a 2-valved capsule 2. NYCTANTHES.

Corolla-lobes induplicate-valvate or 0.

Leaves imparipinnate; (fr. samaroid, indehiscent) 4. FRAXINUS.

Leaves simple.

Fruit a capsule 3. SYRINGA.

Fruit a drupe.

Inflorescence axillary (except in *O. glandulifera*) 5. OLEA.

Inflorescence terminal 6. LIGUSTRUM.

1. Jasminum, Linn.; G. P. n. 1.

Shrubs, usually scandent. *Leaves* opposite (except in *J. humile*), simple 3-foliolate or imparipinnate; petiole usually articulated. *Flowers* fragrant, in axillary or terminal cymes; bracts sometimes petaloid. *Calyx* 5-9-fid; tube funnel-shaped; teeth long or short or 0. *Corolla* white pink or yellow; tube narrow; lobes spreading, imbricate in bud. *Stamens* 2, included in the tube; connective usually produced and triangular. *Ovary* 2-celled; ovules basal, usually 2 in each cell; style cylindrical; stigmas 2, linear. *Berry* 2-lobed, or entire by the failure of 1 carpel; seed usually 1 in each carpel, erect, exalbuminous.

Analysis of the Species.

Leaves opposite ; flowers white.

Leaves simple.

Cymes dense ; flowers sessile, calyx-teeth nearly as long as the corolla-tube . . . 1. *J. pubescens*.

Cymes lax ; flowers pedicellate ; calyx-teeth less than half the length of the corolla-tube . . . 2. *J. arborescens*.

Leaves imparipinnate.

Calyx-teeth very short, triangular . . . 3. *J. dispernum*.

Calyx-teeth long, linear.

Branches long and weak ; corolla-lobes small . . . 5. *J. officinale*.

Branches short and stiff ; corolla-lobes large . . . 6. *J. grandiflorum*.

Leaves alternate, imparipinnate ; flowers yellow (calyx-teeth very short) . . . 4. *J. humile*.

1. ***J. pubescens***, Willd.; Fl. Br. Ind. iii. 592. Syn.—*J. hirsutum*, Willd., Brandis For. Flora 312; Gamble Man. Ind. Timb. 255. Vern. *Chaméli*, Hind.

A scandent shrub ; branches and young parts villous. *Leaves* opposite, simple, 1-3 by 7-15 in., ovate, acuminate, entire, more or less pubescent beneath ; base rounded or cordate, rarely slightly cuneate ; petiole 2-4 in. long, pubescent. *Flowers* scented, white, subsessile, in compact short pedunculate cymes. *Calyx-teeth* usually 7-9, linear, hairy, nearly as long as the corolla tube. *Corolla-tube* 7-8 in. long ; lobes oblong-lanceolate, shorter than the tube. *Fruit* of 1 or 2 carpels, globose or elliptic, surrounded by the calyx-teeth, black when ripe.

Common in the DÚN, especially in hedges outside villages, also along the foot of the SAHÁRANPUR SIWALIKS.

Fl. Dec.-Apr. and also during the rains.

2. ***J. arborescens***, Willd.; Fl. Br. Ind. iii. 594; Brandis For. Flora 311. Vern. *Chaméli*, Hind.

A large shrub, usually suberect. *Leaves* opposite, simple, 3-5 by 2-3 in., ovate, acute or acuminate, entire, soft-tomentose when young glabrate afterwards ; base broadly rounded, sometimes cordate ; petiole 5-8 in. long. *Flowers* white, fragrant, in lax terminal trichotomous cymes ; pedicels 2-3 in. long ; bracts 2 in., linear. *Calyx-lobes* 5-6, linear, 1-15 in. long. *Corolla-tube* 5 in., lobes usually 9, 7 in. long, lanceolate, acute. *Fruit* generally of 1 carpel, 4-6 in. long, ellipsoid, black when ripe.



Fairly common in the WESTERN DŪN, e.g., Āmbāri, Kālsi, etc.; also along the foot of the SAHĀRANPUR SIWALIKS: Rānipur, Bādshāhībāgh, etc.

Fl. Apr., May. Fr. June, July.

Var. *latifolia*, Roxb. is scandent. Found about Āmbāri, W. DŪN.

3. **J. dispersum**, Wall.; Fl. Br. Ind. iii. 602. Brandis For. Flora 312.

A glabrous scandent shrub; branches 4-sided. *Leaves* opposite, imparipinnate, upper often 1-foliate. *Leaflets* 3-5, cordate-lanceolate, acuminate, entire, coriaceous, glabrous, 3-5-nerved at the base terminal 3-4 by 1·4-1·8 in., lateral smaller and very shortly petioled. *Flowers* white, fragrant, both in few-flowered axillary cymes and many-flowered elongated terminal panicles; pedicels 0·3 in. *Calyx-teeth* 0·4 in., triangular. *Corolla-tube* 5-7 in. long; lobes 2·3 in., elliptic or ovate. *Berries* 5 in. long, ellipsoid, dark-purple when ripe.

Bindāl-nālā and other ravines in the DŪN, less common than *J. pubescens*.

Fl. May, Juné. Fr. Sept., Oct.

4. **J. humile**, Linn.; Fl. Br. Ind. iii. 602 Syn.—*J. revolutum*, Sims.; Brandis For. Flora 313; Gamble Man. Ind. Timb. 255. Vern. *Shanjoi*, *Shunjai*, Jaunsar.

An erect small shrub, wholly glabrous; branches angular, green; bark soft. *Leaves* alternate, imparipinnate. *Leaflets* 1-5 pair, 2-3 by 7-12 in., variable in size, ovate or ovate-lanceolate, the terminal usually the largest. *Flowers* dimorphic, yellow, fragrant, in short terminal compound corymbose cymes. *Calyx-teeth* 5, very short. *Corolla-tube* 5·8 in. long; lobes 5, ovate, obtuse. *Berries* ellipsoid, 3·4 in. long.

Common in the OUTER HIMALAYA, JAUNSAAR, and TEHRI-GARHWAL, 4,900 ft.

Fl. Apr.-June. Fr. Sept.-Dec.

5. **J. officinale**, Linn.; Fl. Br. Ind. iii. 603; Brandis For. Flora 313. Gamble Man. Ind. Timb. 255. Vern. *Hōi-bāli*, Jaunsar.

A large twining shrub, branches long, weak, dark-green, slightly ribbed. *Leaves* opposite, imparipinnate; rachis channelled. *Leaflets* 3-7, 2-3 in. long, rhomboid or lanceolate, the terminal largest. *Flowers* white, fragrant, about 8 in. long, in few-flowered corymbose terminal cymes; pedicels 0·7 in. *Calyx-teeth* linear, very variable in length. *Corolla-tube* 6 in. long; lobes 5, 3 by 2 in., acute. *Berries* 3 in. long, subglobose.

JAUNSAAR and TEHRI-GARHWAL, 4,900 ft.: Korwá, Deoban, Mundáli, etc.

Fl. May, June. Fr. Oct., Nov.

6. **J. grandiflorum**, Linn.; Fl. Br. Ind. iii. 603; Brandis For. Flora 313; Gamble Man. Ind. Timb. 255. Vern. *Chambéli* Jaunsar; *Joi*, Garhwal.

A large glabrous scandent shrub, suberect in early life; branches ribbed. *Leaves* opposite, imparipinnate; leaflets 3-7, sessile, the upper pairs generally confluent with the terminal leaflet; petiole marginate. *Flowers* white, with faint pink streaks outside, delightfully fragrant, in lax terminal cymes, rarely solitary and axillary; pedicels slender, 3-1 in. long. *Calyx-teeth* linear, one-third to half the length of the corolla-tube. *Corolla-tube* about 1 in.; lobes usually 5, about 5 in. long, elliptic. *Berries* of 2 carpels, ellipsoid, 3 in. long.

JAUNSAAR and TEHRI-GARHWAL up to 8,500 ft., e.g., Mundáli, Deotá, Lambátách, etc., especially conspicuous at Bodyár.

Fl. May-July.

2. *Nyctanthus*, Linn.; G. P. n. 3.

1. **N. Arbor-tristis**, Linn.; Fl. Br. Ind. iii. 603; Brandis For. Flora 314; Gamble Man. Ind. Timb. 254. Vern. *Kúrri*, Dún; *Harsingár*, Hind.

A small deciduous tree with quadrangular branches and grey or greenish-white rough bark. *Leaves* opposite, 4-5 by 2.5-3 in., ovate, acute, covered with stiff white hairs; base rounded or cuneate; petiole 2-5 in. long. *Flowers* sweet-scented, sessile, 3-7 together in pedunculate heads which are arranged in short trichotomous cymes; bracts elliptical. *Calyx-tube* 2 in., minutely 4-5-toothed. *Corolla-tube* 3-5 in. long, cylindrical, orange-red; limb white, spreading; lobes 5-8, 2-3 in. long, emarginate, contorted in bud. *Anthers* 2, subsessile, inserted near the mouth of the corolla-tube. *Ovary* 2-celled; ovule 1 in each cell, erect. *Capsule* 3-5 in. long, orbicular, compressed, chartaceous 2-celled; seeds exalbuminous.

Extremely common in the forests of the SAHÁRANPUR SIWALIKS, and in some parts of the DÚN, as on the Nágsidh hill and the southern slopes of the HIMALAYA, e.g., at Málkôt, Rájpur, etc. Also at Kálsi in JAUNSAAR. Cultivated in gardens for its flower.

The wood is used only for fuel. The leaves are used for polishing wood and also in native medicine as a febrifuge. The flowers are collected and dried to separate the white corolla-lobes which are then winnowed out, leaving the tubes, from which an orange dye is extracted.

Fl. Aug.-Oct. Fr. Cold season.

3. *Syringa*, Linn.; G. P. n. 6.

1. **S. Emodi**, Wall.; Fl. Br. Ind. iii. 605; Brandis For. Flora 306; Gamble Man. Ind. Timb. 256. Vern. *Shaphroi*, Jaunsar.

A large deciduous shrub; branches lenticellate. *Leaves* 3-4 by 1.5-2 in., elliptic-oblong, short-acuminate, entire, slightly pubescent beneath when young, glabrate and pale beneath when mature; base acute; petiole .3-1 in. long. *Flowers* whitish or purple, scented, in dense-flowered thyrsoid panicles. *Calyx* subtruncate, about .1 in. long, persistent, nearly glabrous. *Corolla* trumpet-shaped; tube .2-.4 long; lobes 4, shorter than the tube, valvate, linear-oblong, tip generally inflexed. *Stamens* 2, near the top of the corolla-tube; anthers half-exserted. *Ovary* 2-celled; ovules 2 in each cell, pendulous; stigma bifid. *Fruit* a coriaceous capsule, .5-.7 in. long, cylindrical, acute, slightly bent, loculicidally 2-valved; seeds pendulous, linear-oblong, flat, ridged along the middle, winged all round.

TEHRI-GARHWAL, JAUNSAAR, and SIMLA HILL STATES, 8, -11,000 ft.: Jádi and Bájámárá Blocks, Cháchpur Range, etc.

Wood white, even- and close-grained. The leaves are used as fodder for goats; cultivated in gardens for its flower.

Fl. May-July. Fr. Sept., Oct.

4. *Fraxinus*, Linn.; G. P. n. 7.

1. **F. floribunda**, Wall.; Fl. Br. Ind. iii. 605; Brandis For. Flora 302; Gamble Man. Ind. Timb. 256.

A large deciduous tree; bark ashy-grey; smooth on young poles, corky and deeply furrowed on mature trees. *Leaves* opposite, imparipinnate; rachis 5-8 in. long. *Leaflets* usually 7, less frequently 5 or 9, lateral opposite, 3-5 by 1-3 in., ovate, oblong, elliptic or lanceolate, usually long-acuminate, falcately serrate, membranous, glabrous above, pilose on the nerves beneath when young; main lateral nerves about 12 pairs, slender, joined by reticulated secondary nerves; petiolules .2-.5 in. long. *Inflorescence* a large terminal panicle; pedicels fascicled on the branches of the panicle. *Flowers* about .15 in. long, generally 2 sexual. *Calyx* minute, acutely 4-toothed, somewhat enlarged in fruit. *Corolla-lobes* .12 in. long, linear-oblong, narrowed at both ends, induplicate-valvate in bud. *Stamens* near the base of the corolla-tube; filaments about .1 in. long. *Ovary* 2-celled; stigma 2-fid; ovules 2 in each cell, pendulous. *Fruit* an oblanceolate samara, 1-1.5 by .2-.25 in., including the wing.

Cultivated in JAUNSAAR about Chakrata and in TEHRI-GARHWAL; also found indigenous in places e.g., at Phaphrota below Deoban and at Kálmí; not very common.



Wood white, with a light red tinge, moderately hard and tough; no heartwood; annual rings distinct; weight 48 lbs. per c. ft. It is used for oars, ploughs, jhampan-poles, etc.

Fl. usually Apr., May. Fr. Aug., Sept.

5. *Olea*, Linn.; G. P. n. 16.

Trees or shrubs. *Leaves* opposite, simple, entire or toothed. *Flowers* often unisexual and dioecious, generally in terminal panicles. *Calyx* 4-toothed or -lobed, or truncate. *Corolla-tube* short, lobes 4 or 0. *Stamens* 2, epipetalous and exserted, or hypogynous (when the corolla is wanting); anthers oblong. *Ovary* 2-celled; ovules 2 in each cell; style short. *Fruit* a drupe, ellipsoid; endocarp hard; exocarp fleshy. *Seed* solitary, pendulous; albumen fleshy.

Analysis of the Species.

- Lateral nerves indistinct, not glandular; under-surface of leaves clothed with reddish scales. 1. *O. cuspidata*.
Lateral nerves distinct, glandular at the axils;
leaves wholly glabrous 2. *O. glandulifera*.

1. ***O. cuspidata***, Wall.; Fl. Br. Ind. iii. 611; Brandis For. Flora 307. Syn.—*O. ferruginea*, Royle; Gamble Man. Ind. Timb. 258. Vern. *Káu*, Jaunsar; *Kahu*, Hind.

A middle-sized tree; bark thin, smooth when young, exfoliating in narrow strips when old. *Leaves* 2-4 in. long, oblong-lanceolate, cuspidate, entire, very coriaceous, dark-green and shining above, thickly clothed beneath with a dense film of minute red scales; margin slightly recurved; midrib prominent; petiole about .2 in. *Flowers* bisexual, whitish, in axillary trichotomous cymes, 1-2 in. long. *Calyx* nearly truncate or with 4 short teeth. *Corolla* deeply divided, lobes .1 in., elliptic, obtuse or acute with a rib along the middle, induplicate-valvate in bud. *Anthers* oval, dehiscing laterally. *Style* short; stigma bifid. *Drupe* 2-3 in. long, ovoid, black when ripe, supported by the remains of the calyx; endocarp bony; pulp scanty, oily.

Fairly common in JAUNSAR and the OUTER HIMALAYA, 3,500-6,000 ft.; cultivated in DEHRA.



52. OLEACEÆ.

[Olea.]

Sapwood whitish; heartwood light-brown to nearly black, extremely hard, often beautifully mottled; weight 65-82 lbs. per c. ft. It polishes well and is much prized for turning, for combs and for agricultural implements. Fairly straight branches are in great demand for the purpose of making into walking sticks. The fruit is eaten, and oil can be extracted from it. The leaves are heavily lopped for fodder.

Fl. Apr., May, and sometimes in September. Fr. Aug.-Nov.

2. **O. glandulifera**, Wall.; Fl. Br. Ind. iii. 612; Brandis For. Flora 309; Gamble Man. Ind. Timb. 258. Vern. *Gair*, *Gaild*, Málkot.

A moderate-sized tree; branches lenticellate; bark of stem rough. *Leaves* 4 by 2 in., ovate-lanceolate, long-acuminate, entire, wholly glabrous; margins slightly undulate; base cuneate; main lateral nerves 9-12 pairs, slender, with glands at the axils on either side of the midrib; petiole .5-1 in. long. *Flowers* cream-coloured, in terminal or lateral compound trichotomous cymes. *Calyx* 4-toothed. *Corolla* deeply divided; lobes valvate, elliptic, .1 in. long. *Anthers* large. *Ovary* glabrate. *Drupe* .5 in. long, ovoid, somewhat oblique, acute at the apex; endocarp bony.

Fairly common along the OUTER HIMALAYAN TRACT between 2,500 and 6,000 ft.: Málkot forest, Paléd, above Rájpur, Tons valley near Kálsi, etc. Also Mothronwála swamp in the Dún, 1,900 ft.

The wood is reddish-grey, hard, and durable, weighing 54 lbs. per c. ft. It takes a good polish and is avoided by insects. It is used in construction, turnery and agricultural implements. The bark is used in medicine, and the leaves are lopped for fodder.

Fl. Apr., May, occasionally during the rains. Fr. Cold season.

6. *Ligustrum*, Linn.; G. P. n. 17.

1. **L. compactum**, Hook.f. & Th.; Fl. Br. Ind. iii. 616; Brandis For. Flora 310; Gamble Man. Ind. Timb. 259. Vern. *Kakur-chhá*, Jaunsar.

A small tree with grey bark; branches often lenticellate. *Leaves* 3-5 by 1-2 in., elliptic-lanceolate, coriaceous, glabrous, shining above; petiole .2-3 in. long. *Flowers* white, subsessile, in compound racemes, which are arranged in terminal panicles. *Corolla-tube* short; lobes oblong, funnel-shaped, induplicate valvate. *Anthers* half-exserted. *Ovary* 2-celled, with 2 ovules in each cell; style of varying lengths, the longest reaching to the base of the anthers; stigma nearly simple. *Fruit* numerous, .2-3 in. long, cylindrical, often curved.

JAUNSAAR and TEHRI-GARHWAL, 4,000 ft.; Karambá peak (Sir D. Brandis), Lokhár, Kathián, Koti, Ghutugádh, Binálgádh, etc.; cultivated in DEHRA (Kowlágarh).

Wood white, moderately hard, close-grained and durable. The leaves are lopped for fodder.

Fl. Apr.-June. Fr. Nov.-Feb.

ORDER 53. APOCYNACEÆ ; G. P. N. 106.

Erect or climbing shrubs, or trees, rarely herbs, usually with milky juice. *Leaves* entire, commonly opposite, sometimes whorled, very rarely alternate. *Flowers* regular, hermaphrodite, solitary or in cymes. *Calyx* inferior; sepals free or slightly connate at the base, generally imbricate in bud. *Corolla* hypogynous, gamopetalous, rotate or salver-shaped; lobes spreading, contorted or twisted (rarely valvate) in bud. *Stamens* 5, inserted on the tube, alternating with the corolla-lobes; anthers opening inward by longitudinal slits, sometimes spurred downwards; connective often adhering to the stigma; pollen granular. *Ovary* 1-celled, with 2 parietal placentas, or 2-celled with axile placentas, or of two distinct or more or less connate carpels; ovules 2 to many in each, rarely solitary; style simple or divided only at the base. *Fruit* a drupe or berry, or of 2 drupes, berries or follicles. *Seeds* pendulous, usually bearing a tuft of long silky hairs; albumen fleshy, or scanty, or 0.

Analysis of the Genera.

- A. Leaves in pairs, opposite.
 - B. Seeds naked.
 - Spinous shrubs generally erect; fr. a 2- or few-seeded succulent berry . 1. CARISSA.
 - Unarmed erect shrubs; fr. of two 1-many-seeded dry or fleshy follicles 3. TABERNÆMONTANA.
 - BB. Seeds comose.
 - C. Trees or large erect shrubs.
 - Anthers included, free; mouth of the corolla-tube naked, white . 4. HOLARRHENA.
 - Anthers exserted, adherent to the stigma; mouth of the corolla-tube with scales, usually orange . 6. WRIGHTIA.

CC. Climbing shrubs.

Corolla-lobes narrow, carpels distinct.

Tips of corolla-lobes deflected; seeds
 often beaked 8. ICHNOCARPUS.

Tips of corolla-lobes not deflected;
 seeds not beaked 9. TRACHELOSPERMUM.

Corolla-lobes broad, carpels at first
 connate 5. VALLARIS.

AA. Leaves whorled, seeds comose, anthers
 included.

Trees, corona absent, carpels distinct 2. ALSTONIA.

Erect shrubs, corona present, carpels at
 first connate 7. NERIUM.

1. *Carissa*, Linn.; G. P. n. 17.

1. **C. spinarum**, A.DC.; Fl. Br. Ind. iii. 631; Syn.—*C. diffusa*, Roxb., Brandis For. Flora 321; Gamble Man. Ind. Timb. 261. Vern. *Karaunda*, Hind.

A small thorny evergreen shrub with light-grey bark and green branchlets; spines 5-1 in. long, often forked, generally at the base of the branches. *Leaves* opposite, 1-1.5 by .7-1 in., ovate, acute, mucronate, glabrate or pubescent beneath, coriaceous, dark-green and shining above. *Flowers* white, scented, in few-flowered corymbose cymes at the ends of the branches. *Calyx-teeth* 5, lanceolate, ciliate. *Corolla-tube* .5 in. long, cylindrical; lobes 5, elliptic-lanceolate, slightly shorter than the tube. *Stamens* included in the corolla-tube. *Ovary* 2-celled, ovules 2 in each cell. *Berry* subglobose or elliptic, .2-3 in. long, shining or pruinose, dark-purple and juicy when ripe. *Seeds* usually 2, concavo-convex, not hairy. [Sir D. Brandis says the berries are 4-seeded. But I have examined hundreds of them from different plants without ever finding more than 2 seeds in any.]

Extremely common and gregarious in scrub jungles in the SAHÁRANPUR DIVISION and in open glades and stony soils (e.g. Tháno) in the DÚN; also found in the lower valleys (up to 4,000 ft.) in JAUNSAIR and TEHRI-GARHWAL.

Wood hard, smooth- and close-grained, and is used for turning and for making combs. It is an excellent fuel. The branches are in great demand for dry fences, and the leaves are greedily eaten by goats and sheep. The ripe berries have a sub-acid sweet taste, and are much eaten by men and birds.

Fl. Apr. June. Fr. Cold season.

C. Carandas, Linn.; Fl. Br. Ind. iii. 630. Vern. *Karaunda*, Hind.—is cultivated in gardens at DEHRA and SAHÁRANPUR. It

Tabernæmontana.] 53. APOCYNACEÆ.

resembles *C. spinarum* in habit, but is usually a taller shrub with larger leaves, and much larger 4- or more-seeded fruits.

2. *Alstonia*. Br. ; G. P. n. 44.

1. *A. scholaris*, Br. ; Fl. Br. Ind. iii. 642 ; Brandis For. Flora 325 ; Gamble Man. Ind. Timb. 262. Vern. *Sátian*, *Chhátian*, *Chhátwán*, *Sátni*, Hind.

A tall evergreen tree with grey bark and verticillate branches ; stem often fluted or buttressed. *Leaves* in whorls of 4-7, 4-8 by 1-1.5 in., obovate, elliptic-oblong or oblanceolate, subsessile or narrowed into a short petiole .25-.5 in. long, coriaceous, glabrous and shining above, dull and pale-green beneath ; lateral nerves numerous, straight, terminating in an intramarginal vein. *Flowers* greenish-white, in compact umbellately-corymbose cymes, the umbels whorled. *Calyx* small, 5-lobed. *Corolla* .3-.5 in. diam., villous inside ; lobes rounded, spreading, twisted in bud. *Stamens* above the middle of the corolla-tube, included ; anthers acute. *Ovary* of two distinct carpels. *Fruit* of two long slender follicles over a foot long and .2 in. diam., hanging in clusters. *Seeds* .3 in. long, slender, flattened, peltately attached, densely ciliate with long hairs all round.

Not very common. Has been met with on the banks of the Bidhálná Ráu and at Kálimatti, Tháno, Rikhikesh and Gularparáo—all in the EASTERN DÚN.

Wood whitish, even-grained, porous, soft, light, and seasons badly ; weight about 30 lbs. per c. ft. It is used in places for tea-boxes and other kinds of packing-cases, and for scabbards, coffins, blackboards, etc. The bark is bitter and possesses valuable medicinal properties.

Fl. Dec.-Mar. Fr. May, June.

3. *Tabernæmontana*, Linn. ; G. P. n. 46.

1. *T. coronaria*, Br. ; Fl. Br. Ind. iii. 646 ; Brandis For. Flora 322 ; Gamble Man. Ind. Timb. 263. Vern. *Chándni*, Dún.

An evergreen shrub, 10-15 ft. high, dichotomously branched, with silvery-grey bark. *Leaves* 4-6 by 1-1.5 in., elliptic-oblong, acuminate, rather coriaceous, shining-green above, pale beneath ; margins undulate, narrowed into a short petiole .25-.5 in. long. *Flowers* pure white, fragrant, often (especially under cultivation) double. *Calyx*-lobes short, broad-ovate, acute, glandular within. *Corolla-tube* .7-1 in. long, slightly inflated in the middle ; limb 1-1.5 in. diam., mouth glandular ; lobes obtuse, margins overlapping, curled. *Stamens* inserted about the middle of the tube ; anthers acuminate. *Carpels* 2,

distinct, glabrous; stigma 2-lobed. *Fruit* of two 3-ribbed somewhat fleshy cylindrical follicles, 2-3 in. long, sessile or nearly so, recurved, deep-red or orange inside. *Seeds* 3-6, oblong, with a fleshy red aril.

Valleys in the OUTER HIMALAYA, e.g. at Tháno and adjoining places, also about Rájpur. It is cultivated in gardens throughout India for its large fragrant flower.

Fl. May-Aug. Fr. Cold season.

4. Holarrhena, Br.; G. P. n. 50.

1. *H. antidysenterica*, Wall.; Fl. Br. Ind. iii. 644; Brandis For. Flora 326; Gamble Man. Ind. Timb. 263. Vern. *Kúra*, Hind.

A small deciduous tree with rough brown bark, exfoliating in irregular flakes. *Leaves* opposite, 6-12 by 2-5 in., elliptic-oblong, acute or acuminate, sub-coriaceous, glabrous; lateral nerves 10-14 pairs; base obtuse or cuneate; petiole 2 in. or less. *Flowers* white or cream-colour, slightly scented, 1-1.5 in. across, puberulous, in terminal corymbose cymes which are 3-6 in. in diam. *Calyx* deeply 5-partite; lobes small, lanceolate, acuminate, with glands inside at their base. *Corolla-tube* 3-5 in. long, cylindrical, swollen at the base round the anthers, throat contracted, naked; lobes as long as the tube, oblong, spreading, over-lapping to the left. *Anthers* subsessile, inserted near the base of the corolla-tube; cells rounded at the base. *Carpels* 2, distinct; ovules numerous; style short, filiform; stigma oblong. *Fruit* of 2 distinct follicles, 8-16 by 2-4 in., spreading and incurved, smooth, usually with white specks. *Seeds* numerous, 5 in. long, linear; hairs silky, of a brownish-grey colour, 1.5 to 2 in. long.

Very common in the DÚN and SAHÁRANPUR FORESTS; also in valleys up to 4,000 ft. in JAUNSAIR and TEHRI-GARHWAL.

The wood is white, soft and even-grained; weight about 40 lbs. per c. ft. It is said to be used at Saháranpur for carving. It is also used for turning and furniture, and beads are made of it to be worn round the neck as a charm. The bark, leaves and seeds are used in medicine, especially the first for dysentery, whence the specific name.

New leaves Apr., May. Fl. May, June. Fr. Cold season.

5. Vallaris, Burm.; G. P. n. 56.

1. *V. Heynei*, Spreng.; Fl. Br. Ind. ii. 650. Syn.—*V. dichotoma*, Wall.; Brandis For. Flora 327; Gamble Man. Ind. Timb. 61. Vern. *Dudhi-bel*, *Safed-bel*, Dún.

A glabrous twining shrub; bark ash-coloured. *Leaves* opposite, 2-4 by 1-1.5 in., elliptic-oblong, acuminate, gland-dotted, glossy above;

petiole 3-6 in., with glands at the axils. *Flowers* pure-white, 7 in. across, fragrant, in lateral dichotomous cymes; pedicels slender. *Calyx* 5-partite; segments ovate-oblong, obtuse. *Corolla-limb* rotate, spreading; tube short, with a broad throat. *Stamens* woolly, inserted at the top of the corolla-tube; filaments short; anthers exserted, connate, forming a cone with the stigma at the apex; cells rigidly purred. *Carpels* 2, at first connate; style filiform. *Fruit* 4-6 by 1.5 in., tapering from a rounded base; pericarp thick. *Seeds* numerous, beaked, 6 in. long, with a tuft of hairs three times their length at the hilum.

Common in the DÚN and SAHÁRANPUR DIVISIONS; also in low valleys in JAUNSAE and TEHRI-GARHWAL.

The switchy branches are used for baskets in the Saháranpur district.

Fl. Dec.-Apr. Fr. Jan.-Apr., next year.

6. Wrightia, Br.; G. P. n. 61.

1. **W. tomentosa**, Roem. & Sch.; Fl. Br. Ind. iii. 653, Brandis For. Flora 323; Gamble Man. Ind. Timb. 264. Vern. *Dúdhi*, Hind.

A small deciduous tree with grey corky bark; extremities tomentose. *Leaves* opposite, distichous, 3-6 by 1.5-3 in., elliptic, caudate-acuminate, rarely obscurely serrulate, rather membranous, velvety-tomentose often on both surfaces, always below, narrowed into a petiole 2-3 in. long; lateral nerves 10-16 pairs. *Flowers* 1 in. across, in many-flowered corymbose terminal cymes; bracts deciduous. *Calyx* short, with 5-10 scales inside at the base; lobes rounded, half the length of the corolla-tube. *Corolla* pale-yellow with a fleshy orange-coloured corona of scales; lobes oblong, overlapping to the left. *Stamens* inserted at the top of the corolla-tube; filaments short and broad, continued into a broad tapering connective; anthers sagittate by the cells being spurred at the base, adherent to the stigma. *Ovary* of 2 connate carpels; style filiform; stigma ovoid. *Fruit* of 2 connate follicles, 8-12 by 5-7 in., straight, cylindrical, laterally compressed, rough with white specks; follicles separating before dehiscing. *Seeds* numerous, 5-7 in., slender, each with a tuft of pure-white silky hairs at the lower end.

Fairly common in the DÚN and SAHÁRANPUR FORESTS, and also found in the lower valleys (e.g., Binálgádh, — Sir. D. Brandis, Dhárágádh, etc.) in JAUNSAE. Also in outer Himalayan open valleys up to 4,000 ft. in TEHRI-GARHWAL.

Wood yellowish-white, moderately hard, close-grained, easy to work; heartwood not distinct; weight about 40 lbs. per c. ft. Used in



turning, and carved into bowls, plates, combs, picture-frames, etc., at Saháranpur. The bark of the stem and the roots is given as an antidote to snake-bite and the sting of scorpions. The Nepalese are said to use the milky juice to stop bleeding.

New leaves Apr., May. Fl. May, June. Fr. Cold season.

7. Nerium, Linn.; G. P. n. 62.

1. **N. odorum**, Soland.; Fl. Br. Ind. iii. 655; Brandis For. Flora 328; Gamble Man. Ind. Timb. 264. Vern. *Kanér*, Hind.

An evergreen shrub with silvery-grey bark. *Leaves* usually in whorls of 3, 4-6 by 1.5-1 in., linear-lanceolate or oblong, thickly coriaceous, acuminate, smooth dark-green and shining above; rough and dotted beneath; midrib stout; lateral nerves numerous, parallel and transverse; petiole short. *Flowers* 1.5 in. diam., red, white or rose-coloured, generally sweet-scented, double under cultivation, in large terminal racemose cymes. *Sepals* broad-subulate. *Corolla* funnel-shaped, lobes spreading, overlapping to the right. *Corona-appendages* 1.5 in. diam., spreading into numerous irregular segments. *Stamens* near the top of the tube; anthers sagittate, conniving around and adhering to the stigma; cells with long twisted appendages. *Fruit* 6-9 by 3-4 in., rigid. *Seeds* linear, ribbed, villous with, and having a coma of, greyish-brown hairs.

Found in dry Ráu beds in the SAHÁRANPUR SIWALIKS, e.g., the Chápri and Ráni Ráus; not common.

"The bark and root are poisonous, and the leaves are used in native medicine."—Mr. J. S. Gamble.

Fl. Apr.-June and often throughout the year. Fr. Cold season.

8. Ichnocarpus, Br.; G. P. n. 73.

1. **I. frutescens**, Br.; Fl. Br. Ind. iii. 669; Brandis For. Flora 327. Vern. *Bel Kámú*, Dún and Saháranpur; *Kali Dúdhí*, Hind.

A twining shrub; extremities and under surface of leaves rusty pubescent. *Leaves* 2-3 by 1.5-2 in., elliptic-oblong or ovate-lanceolate, acute or acuminate, glabrate and dark-green above, more or less pubescent beneath; petiole 2 in. *Flowers* 2-3 in. diam., greenish-white, more or less scented, in axillary and terminal leafy cymose panicles. *Calyx* 5-cleft, with small glands inside; lobes ovate. *Corolla* hypo-crateriform, about 2 in. diam., naked inside; tube swollen round the included anthers; throat contracted, villous; lobes narrowed, hairy inside, ciliate, overlapping to the right. *Anthers* sagittate. *Fruit* of

two distinct slender cylindreal follicles, 3-6 by .15 in. *Seeds* numerous, .5 in. long, slender, pendulous, each with a tuft of scanty white hairs at the hilum.

Common in the DÚN and SAHÁRANPUR FORESTS.

The thin switchy branches are used for making baskets in the Saháranpur district, and fishing-traps in Bengal. The root is often used as a substitute for Sarsaparilla.

Fl. Aug.-Nov. Fr. Feb.-Apr.

9. *Trachelospermum*, Lemaire; G. P. n. 82.

1. ***T. fragrans***, Hook. f.; Fl. Br. Ind. iii. 667; Syn. *Ichnocarpus fragrans*, Wall.; Brandis For. Flora, 327.

A tall climber, young parts pilose; old stems strongly tubercled. *Leaves* 3-5 by 1-1.5 in., elliptic-oblong, acuminate, sub-coriaceous, shining above; petiole .15-.3 in. long. *Flowers* white, fragrant, in compound trichotomous corymbose cymes. *Corolla* salver-shaped, with a campanulate mouth; tube .3 in. long; lobes oblong, hairy near the base, tips not deflected, overlapping to the right, twisted to the left in bud. *Anthers* spurred at the base. *Follicles* 6-9 in. long, cylindrical, acuminate, incurved. *Seeds* 7 in. long, compressed, smooth, having a coma of white hairs.

JAUNSAK and TEHRI-GARHWAL in moist shady ravines, 3,-6,000 ft.: Bámsu valley, Sendrá, Mautárgádh, etc. Also along the banks of the Ré-nadi and in the Mothronwála swamp in the DÚN.

Might possibly be used for the same purposes as *Ichnocarpus fragrans*.

Fl. Apr.-June. Fr. Oct.-Dec.

The following plants belonging to this Family deserve mention:—

1. ***Rauwolfia serpentina***, Benth.; Fl. Br. Ind. iii. 632.—A small shrub about 2 ft. high. *Leaves* 3-7 in. long, elliptic or obovate-lanceolate, short-petioled, soft. *Flowers* pink, about .5-.7 in. long., in long-peduncled many-flowered cymes which are 1-2 in. diam. *Fruit* an oblique drupe, about .3 in. long, black when ripe. Found at Lachiwála in the DÚN. Fl. Nov., Dec.—G. P. n. 20.

2. ***Thevetia neriifolia***, Juss.; Vern. *Pilá Kanér*.—An evergreen shrub with narrow-linear leaves resembling those of *Nerium odorum*, and large fragrant yellow flowers. *Fruit* a 2-celled drupe. Cultivated for its flower.—G. P. n. 27.



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3. *Plumeria acutifolia*, Poiret; Fl. Br. Ind. iii. 641; Vern. *Guláchin*, *Gulchin*, Dún. A soft-wooded small deciduous tree with thick fleshy branches. Flowers white, fragrant, yellow in the centre. It is a native of tropical America but has been naturalised in many parts of India, and is much planted about temples and Mahomedan burial grounds throughout N. India. — G. P. n. 41.

ORDER 54. ASCLEPIADEÆ; G. P. N. 107.

Herbs or shrubs, often climbing, generally with milky juice and noted for strong fibre. Leaves opposite, simple, entire, exstipulate. Flowers regular, bisexual, 5-merous, usually in axillary cymes. Calyx inferior, deeply 5-lobed or divided; segments imbricate. Corolla-tube short; lobes valvate or twisted-imbricate, with a corona of scales at the throat called the *outer* or *corolline corona*. Stamens 5, rarely free, generally connate into a short fleshy column which usually bears a ring or series of processes that are attached to the filaments or to the back of the anthers: this is called the *inner* or *staminal corona*. (Only in rare cases are both coronas present or both absent.) Anthers adnate to the stigma by the connective; pollen in granular or waxy masses which are usually united in pairs to a gland situated on the stigma. Ovary superior; carpels 2, distinct; ovules many, in 2 series in each carpel; styles 2, uniting in the stigma which is 5-angled. Fruit of two follicles, or of only one by abortion; seeds usually compressed or flat, with a tuft of silky hairs (coma) at the hilum; albumen copious.

Analysis of the Genera.

Filaments free; pollen-masses granular, in pairs in each cell.

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|---|-----------------|
| Coronal scales free, not aristate. | 1. CRYPTOLEPIS. |
| Coronal scales connate into a lobed ring; | |
| lobes long-aristate. | 2. PERIFLOCA. |

Filaments connate into a staminal tube; pollen-masses waxy, solitary in each cell.

Anthers with a membranous tip.

Stem erect; corolla-lobes valvate; follicles stout, oblique

3. CALOTROPIS.

Stem twining; corolla-lobes valvate; follicles slender, straight

7. HETEROSTEMMA.

Stem twining; corolla-lobes overlapping.

Follicles stout, straight.

Corolla urceolate or campanulate; corona of erect scales.

Cymes axillary; coronal scales simple

5. MARSDENIA.

Cymes generally interpetiolar; coronal scales notched

6. PERGULARIA.

Corolla rotate; corona of spreading scales

8. DREGEA.

Follicles slender, straight

4. GONGRONEMA.

Anthers without a membranous tip.

Leafy shrubs, more or less twining

9. LEPTADENIA.

A leafless erect shrub

10. ORTHANTHERA.

1. Cryptolepis, R. Br.; G. P. n. 6.

1. **C. Buchanani**, Roem. & Sch.; Fl. Br. Ind. iv. 5; Brandis For. Flora, 330. Vern. *Dúdhí*, *Medhá-singhi*, *Dún*; *Karántá*, Hind.

A large climbing shrub with milky juice. *Leaves* 3-6 by 1-2.5 in., oblong or elliptic, acute or acuminate, coriaceous, glabrous and shining above, glaucous beneath; nerves many, slender, nearly horizontal, terminating in intramarginal veins; base acute; petiole .3-.5 in. long. *Flowers* pale-white, in short-peduncled lax dichotomous cymes. *Calyx* with 5 scales within, short, acute. *Corolla* .6-.7 in. diam.; tube short, throat naked; lobes linear, twisted in bud. *Corona* of 5 fleshy clavate scales, included within the tube. *Stamens* free, included; filaments short, with a broad base; anthers sagittate, with a tuft of hairs at the back, tips acuminate, conniving. *Stigma* broadly conical. *Follicles* 2-4 by .5-.7 in., in divaricate pairs, narrow-lanceolate, straight, somewhat compressed; seeds compressed, oblong-ovate, with a tuft of hairs at the hilum which are about 1 in. long.

Common in the DÚN and SAHÁRANPÚR DIVISIONS, and also met with up to 4,000 ft. in the HILLS, e.g. Binálgádh, Thadiár, etc.

Fl. May, June. Fr. Cold season.

2. Periploca, Linn.; G. P. n. 26.

2. **P. calophylla**, Falc.; Fl. Br. Ind. iv. 12; Brandis For. Flora 330. Vern. *Párh*, Jaunsar.



A glabrous shrub with slender branches. *Leaves* about 3 by 5 in. or smaller, narrow-lanceolate, long-acuminate, coriaceous, shining; lateral nerves very numerous, parallel; petiole 2·3 in. *Flowers* in lax cymes. *Calyx* glandular within; lobes ovate, obtuse. *Corolla* 3 in. diam., rotate, pinkish or pale-yellow; lobes ovate, longer than the tube, usually hairy on the upper surface, greenish below. *Corona* of 5 thick scales, connate into a 10-lobed ring, usually crowned with 5 filiform aristas. *Stamens* included, free; filaments short; anthers bearded at the back and cohering laterally; pollen granular. *Stigma* convex. *Follicles* about 6 by 3 in., in divaricate pairs, cylindrical; seeds linear, 5-7 in. long; coma over 1 in. long.

In shady ravines in the OUTER HIMALAYA, e.g., Sansarú Khálá also in the Tons valley, JAUNSAIR, e.g. Khúnigádh.

Fl. Apr., May. Fr. Cold season.

3. *Calotropis*, R. Br.; G. P. n. 51.

Erect shrubs with milky juice. *Leaves* usually sessile; rather fleshy. *Flowers* in umbelliform cymes. *Sepals* glandular within. *Corolla-tube* broad-campanulate; lobes ovate, valvate. *Corona* of 5 compressed fleshy appendages, adnate to and radiating from the staminal column, spurred at the back. *Anthers* with a broad membranous tip, inflexed on the stigma; pollen-masses waxy, stipitate, pendulous. *Stigma* depressed, pentagonal. *Follicles* single, thick, straight on the ventral and convex on the dorsal side, very oblique and sharply incurved near the base; seeds with a silky coma.

Analysis of the Species.

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| Coronal scales truncate; flower-buds ovoid; corolla-lobes spreading. | 1. <i>C. gigantea</i> . |
| Coronal scales acute; flower-buds hemispherical; corolla-lobes erect. | 2. <i>C. procera</i> . |

1. ***C. gigantea***, R. Br.; Fl. Br. Ind. iv. 17; Brandis For. Flora 331; Gamble Man. Ind. Timb. 265. Vern. *Madár*, *Safed Ák*, Hind.

A middle-sized shrub; young parts covered with adpressed white tomentum; bark pale. *Leaves* sessile, 4-8 by 1-4 in., obovate or oblong, acute or acuminate, coriaceous, cottony beneath; base cordate. *Flowers* downy outside, on long pedicels arranged in axillary or sub-terminal pedunculate simple or compound umbels or corymbs; buds



ovoid. *Corolla* dull-purple or white, .5-1 in. diam.; lobes ovate-lanceolate, spreading. *Corona-scales* elongated but truncate at the apex, hairy. *Follicles* 3-4 in. long, recurved; seeds ovate, .25 in. long with a bright silky white coma.

Believed to be found in the DÚN and possibly also in the SAHÁ-RANPUR DISTRICT, but is certainly very rare in our area.

The hair of the seeds makes a good pillow-stuff, and mixed with a small portion of ordinary cotton may be spun into thread. The fibre of the stems is used for bow-strings, fishing-lines and nets. The wood is made into gun-powder charcoal in the Deccan. The acrid juice and the roots are used in native medicine.

Fl. and fr. throughout the year.

2. **C. procera**, R. Br.; Fl. Br. Ind. iv. 18; Brandis For. Flora 331; Gamble Man. Ind. Timb. 265. Vern. *Ák*, *Madár*, Hind.

Habit, leaves and inflorescence as of the preceding species, excepting that the leaves, 8-9 by 4 in., are more gradually narrowed and somewhat less cottony beneath when mature, and the peduncles rather longer. *Flowers* purplish-red, silvery outside, odorous; buds hemispherical. *Corolla-lobes* erect. *Corona-scales* acute, nearly as broad as long, glabrous or pubescent. *Follicle* as of the last species.

Economic uses, as of *C. gigantea*.

Common throughout the SAHÁRANPUR and DÚN DISTRICTS, generally in fallow lands and ráu-beds, e.g., Ránipur, Phándowála, etc. Also found in low valleys in the HILLS, e.g. Binálgádh, Silgádh, etc.

Fl. and fr. throughout the year, but chiefly in the cold season.

C. Acia, Ham.; Fl. Br. Ind. iv 18,—occurs in grass-lands about Lachiwála in the DÚN. It is an herbaceous plant with petiolate leaves, otherwise closely resembling *C. procera*.

4. Gongronema, Dene.; G. P. n. 102.

1. **G. nepalense**, Dene., Fl. Br. Ind. iv. 33.

A large twining shrub; young shoots and inflorescence pubescent. *Leaves* 4-6 by 2-3.5 in., oblong elliptic or ovate, acuminate, membranous or subcoriaceous, glabrous above, puberulous along the nerves beneath; main lateral nerves about 8 pairs, arcuate, the lowest pair from near the base; base rounded, less frequently subcordate; petiole .8-1.7 in. long, rather slender. *Peduncles* 2-6 in. long, axillary, usually 1 to each pair of leaves, generally branching into 3 long divaricate umbel-be ring arms; pedicels 2-3 in., slender. *Flowers* yellow, .25 in. across. *Calyx* small, 5-partite. *Corolla* campanulate; tube and lobes of about the same length, the latter ovate, slightly overlapping to the right. *Coronal scales* generally absent. *Anther-tips* inflexed, concealing the stigma; pollen-masses solitary in each



cell waxy, erect. *Stigma* clavate or conical. *Follicles* 2·5-3 by 2·3 in., acuminate, thin-walled; seeds 3 in. long, linear; coma of very fine white silky hairs about 1 in. long.

Fairly common in the DÚN;—Lachiwála, Ráipur, Bindál-nálá, etc.

The strong fibre is used for the same purposes as that of *Marsdenia*.

Fl. Aug., Sept. Fr. Sept., Oct.

5. *Marsdenia*, R. Br.; G. P. n. 108.

Twining shrubs. *Leaves* more or less membranous, often cordate. *Flowers* (in the species described below) in corymbosely branched compound cymes. *Calyx* 5-partite. *Corolla* usually campanulate, often with a brush of short hairs at the throat; lobes spreading, overlapping to the right. *Coronal scales* 5, erect, adnate to the back of the anthers. *Anthers* with an inflexed tip; pollen masses waxy, stipitate, erect. *Stigma* truncate or beaked. *Follicles* usually in divaricate pairs, lanceolate; seeds comose.

Analysis of the Species.

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| Coronal scales far exceeding the anther-tips;
leaves cordate, velvety; follicles trans-
versely rugose, beaked. | 1. <i>M. Roylei</i> . |
| Coronal scales not exceeding the anther-tips;
leaves cordately 2-lobed, glabrescent; fol-
licles longitudinally wrinkled, not beaked | 2. <i>M. tenacissima</i> . |

1. ***M. Roylei***, Wight; Fl. Br. Ind. iv. 35; Brandis For. Flora 333; Gamble Man. Ind. Timb. 266. Vern. *Marua-bel* (?), Dún; *Khárchu*, Jaunsar.

A twining shrub; young parts soft-tomentose. *Leaves* 3-6 by 2-4·5 in., ovate, acuminate, often velvety beneath; base usually deeply cordate; petiole 1·5-2 in. *Cymes* 1-1·5 in. diam., much smaller and fewer-flowered than in *M. tenacissima*. *Flowers* somewhat larger. *Calyx* hairy outside. *Corolla-lobes* 1·5-2·5 in. long, hirsute inside. *Follicles* 3 by 1-1·5 in., with a beak-like tip, transversely rugose; pericarp thick; seeds 5 in. long.

Outer slopes of the HIMALAYA; and also in JAUNSAIR and TEHRI-GARHWAL, up to 7,000 ft. Common at Mussoorie



It yields a silky-white strong fibre which is used for fishing-lines and similar other purposes.

Fl. May, June. Fr. Cold season.

2. **M. tenacissima**, W. & A.; Fl. Br. Ind. iv. 35; Brandis For. Flora 333; Gamble Man. Ind. Timb. 265. Vern. *Marua-bel*, Dún.

A large twining shrub; extremities soft-tomentose; bark of stem grey, corky and deeply furrowed on old stems. *Leaves* 4-6 by 3-4 in., broad-ovate, cordately 2-lobed, acuminate, pubescent or tomentose when young; petiole 2-4 in. long. *Flowers* in corymbosely branched cymes. *Corolla* 2 in. diam.; lobes oblong, ciliate. *Follicles* 4-6 by 1'-2 in., lanceolate, finely pubescent, longitudinally wrinkled; pericarp very thick; seeds ovate-oblong, 5 in. long.

Occasionally in Khair forests of the DÚN and along the foot of the HIMALAYA. Less frequently in Sál areas.

The bark of young shoots yields a silky-white fibre of great strength, used for fishing-lines by the Goorkhas and for bow-strings by the "Mountaineers of Rajmahal".- *Sir D. Brandis*. The coagulated milky juice can be used as India-rubber.

Fl. Apr., May. Fr. Cold season.

6. Pergularia, Linn.; G. P. n. 110.

1. **P. pallida**, W. & A.; Fl. Br. Ind. iv. 38; Brandis For. Flora 334, Gamble Man. Ind. Timb. 266.

A large twining shrub with corky bark on old stems; young parts pubescent with soft curved hairs. *Leaves* 2-4 by 1-2-3 in., ovate, cordate, acute or acuminate, entire, rather membranous, tomentose or pubescent beneath until mature; lateral nerves up to 6 pairs; petiole 8-1-3 in. long. *Cymes* very often interpetiolar, umbelliform, hairy; peduncle up to 5 in. long; pedicels 3-7 in. long, slender, much crowded. *Flowers* 5-7 in. across, yellowish-white, inodorous; buds oblong or oblanceolate. *Calyx* 15-2 in. long, campanulate; segments subulate, ciliate at the edges. *Corolla-tube* as long as the calyx, somewhat swollen at the base; lobes linear, 2-4 in. long, overlapping to the right. *Coronal scales* adnate to the back of the anthers, erect, flattened, acute, membranous; pollen-masses erect, waxy. *Follicles* 3-4 by 1 in., lanceolate, longitudinally wrinkled; seeds 4 in. long, broad-ovate, concave, comose.

Not uncommon in the DÚN, e.g., at Karwápáni and Lachiwála. The fibre of young shoots may be found useful.

Fl. May-July. Fr. Sept.-Nov.

7. *Heterostemma*, W. & A.; G. P. n. 114.1. *H. alatum*, Wight; Fl. Br. Ind. iv. 47.

A twining shrub; branches with two lines of grey hairs. *Leaves* 3-6 by 2-4 in. ovate, elliptic or oblong, entire, acute or acuminate; nerves 3-4 pairs, winged beneath, the first two pairs sub-basal; base rounded or cuneate; petiole 1-2 in. long. *Flowers* yellow, about 5 in. diam., usually in racemose cymes; peduncles about 5 in. long, stout; pedicels 2-5 in. long, slender. *Calyx* small, 5-partite. *Corolla* rotate; lobes triangular, valvate. *Corona* of 5 large spreading horizontal lobes; pollen-masses minute, erect, waxy. *Stigma* truncate, 5-angled. *Follicles* double, divaricate through nearly three right-angles, 3-5 by 2-3 in., straight, pointed; pericarp thin; seed, about 5 in. long, dark-brown, membranous; coma about 1 in. long, brownish-white.

Low valleys in JAUNSAH and TEHRI-GARHWAL up to 5,000 ft.; rather scarce: Thadiár. — Mr. J. S. Gamble.

Fl. Rainy season. Fr. Cold season.

8. *Dregea*, E. Meyer; G. P. n. 117.1. *D. volubilis*, Benth.; Fl. Br. Ind. iv. 46.

A stout twining shrub with a woody stem, and usually with rather stout and stiff branches; innovations generally hoary-tomentose. *Leaves* 3-5 by 2-3.5 in., ovate, entire, acute or acuminate, rather coriaceous, usually tomentose beneath when young; main lateral nerves up to 5 pairs; base rounded truncate or cuneate, less often cordate; petiole rather stout, 8-2 in. long. *Cymes* axillary or inter-petiolar, umbelliform; peduncles 1-3 in. long, slender, drooping; pedicels 5-1.5 in., rusty-scaberulous. *Flowers* green, 3-5 in. diam. *Calyx* about 1 in. across, stellate. *Corolla* dark-green, cup-shaped; lobes broadly triangular, overlapping to the right. *Coronal scales* 5, fleshy, hemispherical, adnate to the very short column, spreading, inner angle cuspidate; pollen-masses erect, waxy. *Stigma* dome-shaped. *Follicles* usually double, 3-4 by 1-1.2 in., lanceolate, longitudinally ribbed, velvety until mature, afterwards minutely tomentose; seeds 3-4 in. long, broad-elliptic, concave, shining, with sharp edges; coma of very fine white silky hairs about 1.5 in. long.

Very common in Khair forests in the DŪN and SAHARANPUR DIVISIONS, especially in the Jumna and Sōng valleys, up to 5,000 ft. Also in low valleys in JAUNSAH, e.g., Kándá, 4,500 ft.

Fl. Apr.-June. Fr. Cold season.

9. *Leptadenia*, Br.; G. P. n. 125.1. *L. reticulata*, Wight; Fl. Br. Ind. iv. 63.

A diffuse twining shrub with corky bark on old stems; young parts hoary. *Leaves* 2-3 by 1-1.5 in., ovate oblong or elliptic, acute, entire, coriaceous, pale, glaucous beneath; lateral nerves 6-8 pairs but very faint; base rounded cuneate or acute, scarcely cordate; petiole .3-1.3 in. *Cymes* axillary, umbelliform, .5-1 in. diam., many-flowered; peduncle .3-6 in. long, rather stout; pedicels of varying lengths, but never exceeding the peduncle. *Flowers* dirty- or brownish-white, .2 in. diam. *Calyx* half the length of the flower; lobes acute or obtuse. *Corolla* rather fleshy; lobes pubescent, with margins folded inward, hooked and bearded at the tip, valvate in bud. *Corona* double,—corolline of 5 scales between the corolla lobes, staminal of an undulate wing at the base of the anthers. *Stigma* included, 5-angled. *Follicles* generally solitary by abortion, 2-3 by .5-7 in., straight, turgid, very hard, smooth, with a thick curved beak; seeds .5 in. long, narrow-ovoid, flat, winged, comose at the hilum.

Along the foot of the SAHÁRANPUR SIWALIKS: Khárá, Bar-kálá, Ránipur, etc.

Fl. May-July. Fr. Cold season.

10. *Orthanthera*, Wight; G. P. n. 125.

(United with *Leptadenia* in the "Gen. Plantarum.")

1. *O. viminea*, Wight; Fl. Br. Ind. iv. 64; Brandis For. Flora 335. Syn.—*Leptadenia viminea*, Wight; Gamble Man. Ind. Timb. 266. Vern. *Mahúr-grás*, *Khip*, Hind.

A small erect twiggy leafless green shrub. *Flowers* about .2 in. long, dirty-brown, in few-flowered woolly cymes; peduncles .2-1 in. long. *Calyx* parted nearly to the base; sepals lanceolate, without glands. *Corolla* salver-shaped; tube cylindrical; lobes oblong, valvate in bud. *Corona* double, - corolline of minute scales alternating with the corolla-lobes, staminal an undulating ring below the anthers; anthers without a tip; pollen-masses stipitate, erect. *Follicles* solitary, 4-6 in. long, linear, compressed, erect; pericarp thin, brown inside; seeds .2 in. long, brown; coma of very fine silky hairs about .5 in. long.

Found in the ráu-beds of the SAHÁRANPUR FORESTS; also in the Sông, Súswá and Ganges rivers in the Dún.

The flower-buds are eaten as a vegetable in Oudh, and rope is made of the fibre.

Fl. Feb.-May. Fr. Sept.-Nov.

Gymnema tingens, W. & A.; Fl. Br. Ind. iv. 31,—has been found near Nakraunda in the Dún, too late for detailed description. It is a climbing shrub, glabrous or nearly so; old stem with corky bark. *Leaves* 4-6 by 2-3.5 in., ovate, often cordate, membranous. *Follicles* generally single, about 4 by 1 in., smooth, glabrous, acute at both ends, slightly beaked. Fr. Nov., Dec.—G. P. n. 101.



ORDER 55. LOGANIACEÆ; G. P. N. 108.

Trees, shrubs, or herbs. *Leaves* opposite, simple, with interpetiolar stipules or a raised transverse line at the internodes. *Flowers* regular, in simple or compound axillary or terminal cymes. *Calyx* small, 4-5-toothed. *Corolla* 4-5-partite, imbricate or valvate. *Stamens* epipetalous, alternating with the corolla-lobes. *Ovary* free, 2-celled; ovules one or more in each cell; style simple; stigma simple or 2-lobed. *Fruit* a berry or a capsule, 1-many-seeded; albumen copious.

Analysis of the Genera.

- Erect shrubs. Corolla imbricate; fruit a capsule . 1. BUDDLEIA.
Scandent shrubs. Corolla valvate; fruit a berry . 2. GARDNERIA.

1. *Buddleia*, Linn.; G. P. n. 14.

Trees, shrubs, or herbs, usually mealy- or woolly-tomentose. *Leaves* united by a stipular line. *Flowers* tetramerous. *Corolla-lobes* imbricate in bud. *Stamens* 4; filaments very short. *Style* linear; ovules many in each cell; stigma entire. *Capsule* septicidally 2-valved; seeds small, many.

Analysis of the Species.

- Flowers in interrupted panicles of heads; tomentum tawny or rust-coloured . . . 1. *B. paniculata*.
Flowers in dense cylindrical spikes; tomentum grey . . . 2. *B. asiatica*.

1. *B. paniculata*, Wall.; Fl. Br. Ind. iv. 81; Brandis For. Flora 318; Gamble Man. Ind. Timb. 267. Vern. *Sendroi*, Jaunsar.

An evergreen shrub with a crooked stem; bark thin, light-grey, peeling off in long strips; extremities rusty-tomentose. *Leaves* 4-6 by 2 in., variable from lanceolate to ovate-triangular, dentate crenate or sub-entire; petiole 5-1.5 in. *Flowers* fragrant, subsessile, in pedunculate heads or clusters forming an irregular panicle. *Calyx* 1.5-2 in., urceolate, woolly outside; teeth short. *Corolla* pink and white, tomentose outside, tubular; lobes rounded, obtuse. *Capsule* ellipsoid, 2 in. long.

Fairly common in JAUNSAI and TEHRI-GARHWAL, 4,000-7,500 ft., especially on exposed sunny slopes; e.g., Deoban, along the Lower Chakrata road; Lubasu Block, Lambátách; etc.

Wood moderately hard and close-grained, weighing 41 lbs. per c. ft., but is used only as fuel. Likely to be useful in re-stocking bare hill-sides.

Fl. Apr., May.

2. *B. asiatica*, Lour.; Fl. Br. Ind. iv. 82; Brandis For. Flora 318; Gamble Man. Ind. Timb. 266. Vern. *Dúdhia*, Dún.

A large evergreen shrub; bark thin, grey; extremities densely clothed with soft grey tomentum. *Leaves* 4-6 by 1-1.2 in., lanceolate, serrulate, glabrous and dark-green above, densely grey- or white-tomentose beneath; petiole .2 in. or 0. *Flowers* odorous, sessile, in dense bracteate spikes. *Calyx* .15-.2 in., campanulate; teeth triangular. *Corolla-tube* urceolate; lobes short, rounded, imbricate, white at first but fading into deep purple. *Capsule* .2-.3 in. long, ellipsoid; valves bifid.

Common in ravines and grass lands in the DÚN and SAHÁRANPUR DIVISIONS, and is often planted in gardens for ornament.

Wood tough and moderately hard. The branches would probably make good walking-sticks. Weight 44 lbs. per c. ft.

Fl. Mar., Apr.

2. *Gardneria*, Wall.; G. P. n. 30.

1. *G. angustifolia*, Wall.; Fl. Br. Ind. iv. 93.

A large scandent glabrous shrub. *Leaves* opposite, 3-4 by 1 in., lanceolate, acuminate, entire, glabrous, rounded or acute at the base; petiole 2-3 long. *Flowers* about .5 in. across, solitary, on nodding filiform axillary peduncles .4-1 in. long. *Calyx* small, deeply 4-5-lobed. *Corolla* rotate; lobes .2 in. long, thick, valvate in bud. *Stamens* 4-5, on the corolla tube; anthers subsessile; cells ovate, subconnate. *Ovary* 2-celled; ovule 1 in each cell; style cylindrical; stigma 2-lobed. *Fruit* a berry, .3 in. diam., scarlet.

Found at Mussoorie and in the Bear Garden below Chakrata. Very scarce.

Fl. June, July.

ORDER 56. BORAGINEÆ; G. P. N. 112.

Herbs, shrubs, or trees. *Leaves* simple, alternate, rarely subopposite or opposite. *Flowers* in simple or

compound, usually-terminal cymes, rarely solitary or axillary. *Calyx* persistent ; lobes usually 5, valvate in bud. *Corolla* hypogynous, gamopetalous, often with scales in the throat ; segments as many as those of the calyx, generally imbricate in bud. *Stamens* epipetalous, alternating with the corolla-lobes. *Ovary* superior, of 2-carpels, entire or 4-lobed ; cells usually 2-ovuled ; style simple or forked, terminal or gynobasic (from between the ovary lobes). *Fruit* a drupe with 1-4 kernels, or separating into 2-4 nutlets ; seeds erect or oblique.

Analysis of the Genera.

- | | |
|---|---------------------|
| Style twice forked ; fruit at least .5 in. diam., usually 1-celled, 1-seeded. | 1. <i>CORDIA</i> . |
| Style 2-fid ; fruit up to .2 in. diam., with 1-4 kernels. | 2. <i>EHRETIA</i> . |

1. *Cordia*, Linn.; G. P. n. 1.

Trees or shrubs. *Leaves* alternate, rarely sub-opposite, petioled, usually coriaceous. *Flowers* often polygamous, in terminal or leaf-opposed cymes. *Calyx* 4-5-toothed ; teeth accrescent in fruit. *Corolla* funnel-shaped ; lobes 4-8. *Stamens* 4-8 ; filaments hairy. *Ovary* entire, 4-celled, 1 ovule in each cell ; style twice bipartite, terminal. *Drupe* ovoid ; endocarp hard, usually 1-celled by abortion ; albumen 0.

Analysis of the Species.

- | | |
|--|------------------------|
| Leaves broad-ovate, glabrescent ; calyx not ribbed. | 1. <i>C. Myxa</i> . |
| Leaves rotundate, scabrous above, tomentose beneath ; calyx ribbed | 2. <i>C. vestita</i> . |

1. *C. Myxa*, Linn. ; Fl. Br. Ind. iv. 136 ; Brandis For. Flora 336 ; Gamble Man. Ind. Timb. 270. Vern. *Lassorá*, *Lassúrá*, *Lessorá*, Hind.

A middle-sized deciduous tree, usually with a long bole ; bark grey or brown, with shallow longitudinal wrinkles. *Leaves* variable, 3-6 by 2-4 in., broad-ovate, crenate or wavy at the margins, coriaceous,



obscurely hairy beneath when young, from slightly scabrous to glabrous above; base rounded or cuneate; lateral nerves 4-6 pairs, the first pair sub-basal; petiole .5-2 in. *Flowers* white, polygamous, usually pentamerous, in loose ebracteate corymbose cymes. *Calyx* 1.15 in., irregularly toothed, not ribbed, accrescent in fruit. *Corolla-lobes* 1.12 in.; tube hairy within. *Drupe* yellow and glossy when ripe, usually 1-seeded, filled with a viscid-sweetish pulp.

Common in the DÚN and SAHÁRANPUR FORESTS affecting shady ravines. Also Tons and other low valleys in JAUNSAAR and TEHRIGARHWAL.

Wood soft and porous, but seasons well and is fairly strong, used chiefly for fuel; weight 33 lbs. per c. ft. The fibre of the bark is made into ropes and is used to caulk boats. The fruit is eaten, both tender and ripe. The viscid pulp of the ripe fruit is used as bird-lime. The leaves are often used as plates.

Fl. Mar., Apr. Fr. May-July.

2. *C. vestita*, Hook. f. & Th.; Fl. Br. Ind. iv. 129; Brandis For. Flora 338; Gamble Man. Ind. Timb. 271. Vern. *Barolá*, *Bairolá*. E. Dún and Garhwal; *Kúm*, Saháranpur; *Kúm-paiman*, Hind.

A small deciduous tree with a low rounded crown; bark greenish-grey, smooth, exfoliating in large woody scales; young parts covered with grey pubescence. *Leaves* 3-6 by 2.5-5 in., broad-elliptic or orbicular, acuminate, coriaceous, scabrous above, tomentose beneath until mature; lateral nerves 3-5 pairs, the lowest sub-basal; base cuneate, rounded or shallow-cordate; petiole 1.15 in. *Flowers* yellowish-white, polygamous, in dense compound cymes. *Calyx* .5 in. long, more or less ribbed outside. *Corolla-lobes* .3 in., ovate-oblong, spreading; tube as long as the lobes. *Drupe* .7 in. long, supported by the accrescent saucer-shaped calyx, and cuspidate with the remains of the style, filled inside with a gelatinous pulp.

Fairly common in the SAHÁRANPUR SIWALIKS and only occasionally met with in the DÚN, e.g. Tháno, Phándowála, Timli, etc.

Heartwood light-brown, beautifully mottled with darker veins, even-grained, hard, strong, tough and elastic, and is employed, where known, for wheel and well-work; weight 52-53 lbs. per c. ft. The pulp of the fruit is eaten.

Fl. and young leaves Mar., Apr. Fr. Oct., Nov.

2. *Ehretia*, Linn.; G. P. n. 6.

Trees or shrubs. *Leaves* alternate, entire or toothed. *Flowers* small, in axillary or terminal corymbs or panicles. *Calyx* deeply 5-partite. *Corolla* rotate;



lobes 5, imbricate in bud. *Stamens* 5; anthers generally exserted. *Ovary* 2-celled; cells 2-ovuled; style terminal, bifid. *Fruit* a sub-globose drupe with 1-4 pyrenes; pyrenes solitary and 4-celled, or 2 and 2-celled, or 4 and 1-celled; cells 1-seeded; albumen scanty.

Analysis of the Species.

Leaves serrate; flowers in terminal panicles. . 1. *E. acuminata*.
Leaves entire; flowers in terminal and axillary
dichotomously compound corymbose cymes . 2. *E. laevis*.

1. *E. acuminata*, R. Br.; Fl. Br. Ind. iv. 141. Syn.—*E. serrata*, Roxb.; Brandis For. Flora 339; Gamble Man. Ind. Timb. 272. Vern. *Pandāyan*, Dún; *Pāna*, Jaunsar and Hind.

A middle-sized tree nearly glabrous; large stems more or less fluted; bark brown, or when old mostly dark-grey, with longitudinal furrows or cracks. *Leaves* 3-5 by 1-2.5 in., elliptic-oblong, acuminate, sharply serrate, glabrescent and shining above, tough but rather thin; lateral nerves 8-10 on either side; petiole .5-.7 in. *Flowers* numerous, white, fragrant, in large conical terminal panicles. *Corolla-lobes* .12 in., reflexed. *Style* bifid for less than half its length. *Drupe* 12-16 in. diam., with two 2-celled and 2-seeded pyrenes.

Fairly common in grass-lands in the WESTERN DÚN, and also found at Kálsi and lower valleys in JAUN SAR up to 5,000 ft.: Binálgádh, Silgádh, Thadiár, etc. Also at Káluwála, Nakraunda, Gulá-tappar, etc. in the E. DÚN.

Wood light-brown, soft, light, fairly compact, easily worked; used for agricultural implements, scabbards, sword-hilts, etc.; weight 37 lbs. per c. ft. The fruit is eaten and the leaves are lopped for cattle-fodder.

Fl. Mar., Apr. Fr. Nov., Dec.

2. *E. laevis*, Roxb.; Fl. Br. Ind. iv. 141; Brandis For. Flora. 340; Gamble Man. Ind. Timb. 272. Vern. *Chamrôn*, Hind.

A moderate-sized deciduous tree with an irregular-shaped trunk, and a spreading crown; bark smooth, mealy-grey outside, inner substance yellow, soft, not fibrous. *Leaves* 3-6 in. long, elliptic, obtuse or acuminate, entire, membranous while young, hard and fleshy when mature, glabrous or glabrescent, dark-green; nerves 6-10 on either side of the midrib; base cuneate, rarely rounded; petiole .5-1 in. *Flowers* white, small, in terminal or axillary dichotomously-branched corymbose cymes. *Corolla-tube* .1 in.; lobes .12 in., spreading. *Drupe* .2 in. diam., globose, depressed, 4-ribbed, with 1-4 1-seeded pyrenes.



57. CONVULVACEÆ.

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Exceedingly common in the DÚN and SAHÁRANPUR FORESTS, generally in damp shady places, e.g., Lachiwála coppice, Kánsráo Pass, etc. Also in the Ámláwa and Tons valleys in JAUNSAH.

Wood tough and fairly durable, and is sometimes used for agricultural implements, but in the School Circle, chiefly as fuel; weight 33-38 lbs. per c. ft. "The leaves are given as cattle-fodder."
—Sir D. Brandis.

Fl. Mar., Apr. Fr. Cold season.

ORDER 57. CONVULVACEÆ; G. P. N. 113.

Herbs or shrubs, usually twining. *Leaves* alternate, simple, exstipulate. *Flowers* regular, bisexual, pentamerous, often showy. *Calyx* persistent, deeply 5-lobed; lobes imbricate, sometimes enlarged in fruit. *Corolla* campanulate or funnel-shaped, often 5-plaited in bud. *Stamens* 5; anthers oblong. *Ovary* superior, 2-carpelled and 2-celled, or by false dissepiments 4-celled. *Style* 1, rarely 2; stigma 2-lobed or branched. *Fruit* indehiscent, often breaking up irregularly; albumen 0 or scanty; cotyledons generally plaited.

A Family of very little forest interest.

1. *Porana*, Burm.; G. P. n. 17.

1. *P. paniculata*, Roxb.; Fl. Br. Ind. iv. 222; Brandis For. Flora 342. Vern. *Bel Kámu*, *Safed-bel*, Saháranpur.

A large twining shrub; branchlets, inflorescence and underside of leaves clothed with grey pubescence. *Leaves* very variable in size, 2-; by 1·5-3 in. (those running into the inflorescence much smaller), ovate-cordate, acuminate entire, membranous, pubescent, with 5-7 basal nerves; petiole 1·5 in. long. *Flowers* very numerous, small, white, in large axillary and terminal leaf-bearing panicles. *Sepals* in flowers 1 in. long, linear-oblong, at least 3 enlarged in fruit into ovate-oblong, membranous, strongly reticulate, shortly stalked wings, 6·9 in. long, with a prominent midrib. *Corolla* 2 in. long; limb 5-plaited. *Filaments* short. *Ovary* 2-celled, 4-ovuled; style short; stigma obscurely 2-lobed. *Capsule* 2 in. diam., globose, hairy, membranous, fragile, 1-seeded by abortion; seed glabrous.

Very common in the DÚN and SAHÁRANPUR FORESTS, generally in scrub jungles.

This climber is largely used in the Sahāranpur district for making into baskets, and is generally preferred to all other plants used for the same purpose. The baskets used in removing earth while the Ganges Canal was being excavated are said to have been chiefly made of this climber.

Fl. Oct.-Jan. Fr. Mar., Apr.

Several plants of this Family are cultivated for their showy flowers, notably the following :—

1. *Rivea ornata*, Chois.; Fl. Br. Ind. iv. 183.—A climber with large white flowers about 2 in. across.—*G. P. n. 2.*

2. *Argyreia Roxburghii*, Chois.; Fl. Br. Ind. iv. 185.—Flowers large, purple or rose.—*G. P. n. 3.*

3. *Ipomœa bona-nox*, Linn.; Fl. Br. Ind. iv. 197.—Flowers large, white, with greenish plaits.—*G. P. n. 9.*

The following indigenous plants deserve notice :—

1. *Lettsomia Thomsoni*, Clarke; Fl. Br. Ind. iv. 193,—is found on the dry bare hill-slopes above Moindrot, 3,000 ft., also in the SIWALIKS, 2,500 ft. Flowers rose-purple, May-Oct.—*G. P. n. 7.*

2. *Cuscuta reflexa*, Roxb.; Fl. Br. Ind. 225. The Dodder. Vern. *Akās-bel*, Hind.; *Sarag-bāli*, Jaunsar;—is the well-known leafless greenish-white or yellow flowering parasite very common in the scrub forests of the SAHARANPUR DIVISION, and in similar localities in the DUN, chiefly affecting all species of *Zizyphus* and also *Adhatoda Vasica*. The seed germinates on the ground, but the plant does not seem to derive much nourishment from it, its growth being sustained, for the little while it is obliged to shift for itself, by the fleshy albumen in which the germ-plant is imbedded in the seed. As soon as the seedling twines itself round a woody plant, it develops several thick sucker-like haustoria along the surface of contact, which, penetrating the bark of the host, draw nourishment from the cambium-layer. When this is effected, it soon loses its attachment to the soil, and the portion of it below the lowest haustorium then dries and rots away. Henceforth the parasite goes on flourishing entirely at the expense of the host. It is used in veterinary practice for poultice on sprains, Fl. Oct.-Feb.—*G. P. n. 32.*

Fl. Sept.-Feb. Fr. Feb.-Apr.

ORDER 58. SOLANACEÆ; G. P. n. 114.

Herbs or shrubs, rarely soft-wooded small trees. Leaves alternate, exstipulate. Flowers solitary or in

clusters or cymes, axillary, extra-axillary or terminal, regular, bisexual, usually pentamerous. *Calyx* inferior, free, usually persistent, sometimes enlarged in fruit. *Corolla* gamopetalous, rotate or campanulate, often plaited; limb 5-or more-lobed, or entire. *Stamens* 5, epipetalous. *Ovary* superior, usually 2-celled; ovules many, on peltate placentas; style simple. *Fruit* a many-seeded berry or capsule; seeds generally compressed.

This Family is of no special forest interest, although plants of considerable economic importance, such as the potato, brinjal, chillie (*Capsicum*), tomato (*Lycopersicum*), tobacco (*Nicotiana*), and Cape-gooseberry (*Physalis*) belong to it. Some are poisonous, e.g. *Datura*, while others are valuable in medicine.

1. *Solanum*, Linn.; G. P. n. 2.

1. ***S. verbascifolium***, Linn.; Fl. Br. Ind. iv. 230 Gamble, Man. Ind. Timb. 273. Vern. *Ban Tamákú*, Dún; *Asedú*, Garhwal.

A tall soft-wooded shrub, unarmed; bark light-grey; extremities and inflorescence stellate-woolly. *Leaves* alternate or falsely sub-opposite, 7-9 by 3-5 in., elliptic, acute at both ends or often rounded at the base, entire, subcoriaceous, stellately woolly, giving a fetid smell when bruised; petiole 1-2 in. *Flowers* in very woolly dichotomous cymes. *Calyx*-lobes enlarged in, but much shorter than, the fruit. *Corolla* 7 in. diam., white, woolly outside; limb plaited in bud. *Stamens* 5, on the corolla-throat; anthers apicular and joined into a cone round the style, opening by terminal pores. *Ovary* usually 2-celled. *Berry* 3-5 in. diam., yellow when ripe.

Fairly common in moist shady places in the DÚN (e.g., banks of the Song river), and in hedges round villages.

Wood very light, yellow, very soft, scarcely used even as fuel. The leaves and fruit are used in native medicine.

Fl. and fr. almost throughout the year.

S. indicum, Linn.; Fl. Br. Ind. iv. 234. Vern. *Bhút-katáid*, Hind. Is a common weed of waste lands, prickly all over, with blue flowers and yellow berries, the latter 3-4 in. diam. The fruit, leaves and roots are used in native medicine.

S. Melongena, Linn.; Fl. Br. Ind. iv. 235. Vern. *Bhattá*, *Báigan*, *Báingan*, Hind. The Brinjal. Is much cultivated except in the hills.



S. tuberosum, Linn.; Fl. Br. Ind. iv. 229,—is the Potato, Vern. *Alu*, Hind., which is extensively cultivated throughout the SCHOOL CIRCLE, up to 9,000 ft.

ORDER 59. BIGNONIACEÆ; G. P. N. 120.

Usually trees, sometimes woody climbers, rarely herbs. *Leaves* usually opposite, pinnately compound, sometimes undivided; stipules none. *Flowers* bisexual, irregular, showy, generally in terminal panicles or racemes. *Calyx* free, 2-5-lobed, truncate or spathaceous; lobes valvate in bud. *Corolla* often 2-lipped; lobes 5, unequal, imbricate in bud. *Stamens* epipetalous, usually 4 and didynamous, —the fifth wholly absent or rudimentary, or rarely fertile and nearly equalling the others. *Ovary* superior, free, 2-celled, more or less stipitate and supported by an annular disk; ovules numerous; style filiform; stigma 2-lobed. *Fruit* an elongated 2-valved capsule; seeds winged, exalbuminous.

Analysis of the Genera.

- | | |
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| Perfect stamens 5; capsule flat, septicidally 2-valved; seeds discoid. | 1. OROXYLUM. |
| Perfect stamens 4; capsule terete, loculicidally 2-valved; seeds wedge-shaped. | 2. STEREOSPERMUM. |

1. *Oroxylum*, Vent.; G. P. n. 21.

1. *O. indicum*, Vent.; Fl. Br. Ind. iv. 378; Gamble Man. Ind. Timb. 375. Syn.—*Calosanthes indica*, Bl.; Brandis For. Flora 347. Vern. *Tarlá*, Dún; *Pharrái*, *Pharnát*, E. Dún; *Tantiá*, Garhwal.

A small tree with few branches and a small open crown; bark soft, light brownish-grey and corky outside. *Leaves* opposite, 3-pinnate near the base, 2-pinnate about the middle, and simply pinnate towards the apex, 4-6 ft. long; pinnae 3-4 pairs; 2-3 lower pairs bipinnate at the base, the pinnules being 3-5-foliolate. *Ultimate leaflets* 3-5 by 2-3·5 in., broad-ovate, acuminate, entire, glabrous. *Flowers* large, fleshy, in lax terminal racemes; peduncle 2-3 ft.; pedicels 1-1·5 in. long. *Calyx* 1



Stereospermum.] 59. BIGNONIACEÆ.

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by 6 in., fleshy, nearly truncate. *Corolla* campanulate; tube green outside; limb 2-3 in. across; lobes 5, dark-red. *Stamens* 5, all fertile and nearly equal. *Capsule* shortly stipitate, 18-30 by 2.5-3.5 in., scabard-like; seeds surrounded by a broad transparent white papery wing, 2.2-5 in. across, including the wing.

Fairly common in the DÚN and SAHÁRANPUR FORESTS, and in the OUTER HIMALAYAN slopes up to 4,000 ft.

Wood yellowish-white, open-grained, very light and soft, scarcely used except for fuel. Weight 30 lbs. per c. ft.

"The bark and fruit are used in tanning and dyeing, and the seeds are used to line hats, and, placed between two layers of wicker-work to make umbrellas. Root, bark, leaves, and seeds are used in native medicine."—*Sir D. Brandis*.

Leafless Mar., Apr. Fl. June, July. Fr. Cold season.

2. *Stereospermum*, Chamisso; G. P. n. 37.

1. *S. suaveolens*, DC.; Fl. Br. Ind. iv. 382; Brandis For. Flora 351; Gamble Man. Ind. Timb. 278. Vern. *Pádal*. Hind.

A large deciduous tree, young parts viscous hairy; bark grey, exfoliating in large flat scales. *Leaves* opposite, 12-24 in. long, imparipinnate. *Leaflets* 5-9, more commonly 7, 3-6 by 2-3.5 in., broad elliptic; acute or acuminate, sharply serrate on young, entire on old trees, coriaceous, scabrous or velvety-tomentose; lateral nerves 6-8 pairs; petiolules about .1 in. *Flowers* dark-purple, pubescent, fragrant, in viscid trichotomous panicles. *Calyx* 2-3 in., campanulate, shortly 3-5-lobed. *Corolla* 1-1.5 in. long, very soft; tube cylindrical, throat hairy; limb oblique, 2-labiate; lobes rounded, with curled edges. *Stamens* 4, didynamous, with a rudimentary fifth. *Disk* fleshy, annular. *Capsule* 15-24 by .6-.8 in., obscurely 4-ribbed, dark-grey with elevated white specks; dissepiment cylindrical, brown, corky; seeds 1.2 by .3 in.

Fairly common in the DÚN and SAHÁRANPUR FORESTS, especially in Sál areas, with a tendency to become somewhat gregarious on clayey soils.

Sapwood white, fairly hard. Heartwood small, yellowish-brown, mottled with darker streaks, very hard, seasons and polishes well, and is fairly durable; weight 40-50 lbs. per c. ft. Sir D. Brandis says it is "much valued for building and generally commands a ready sale"; but it does not seem to be much cared for in the School Circle. It yields excellent charcoal, and the root and bark are used in native medicine.



59. BIGNONIACEÆ. [*Stereospermum*.

New leaves and fl. May, June. Fr. Cold season, but remaining long on the tree.

Millingtonia hortensis, Linn.; Fl. Br. Ind. iv. 377. The Indian Cork-tree, Vern. *Akás Nim*, Hind.—Is a handsome tall tree, with fragrant white flowers, cultivated in avenues and gardens in DEHRA and most places in the plains.—G. P. n. 20.

Amphicome emodi, Lindl.; Fl. Br. Ind. iv. 385;—Is an herbaceous plant found in the crevices of limestone rocks in JAUNSA, e.g. Mátkángá, and along the pipe-line between Chakrata and Deoban. Leaves pinnate; leaflets about 1 in. Flowers bright-rose, about 2 in. long. Capsule terete, about 9 in. long.—G. P. n. 42.

ORDER 60. ACANTHACEÆ; G. P. n. 122.

Herbs or shrubs, rarely trees, usually with swollen joints. Leaves opposite, simple, exstipulate. Flowers with large persistent bracts and bracteoles. Calyx 5-partite. Corolla 2-lipped, or subequally 5-lobed; lobes imbricate or twisted in bud. Stamens 4 or 2, inserted on the corolla-tube. Disk often conspicuous. Ovary superior, 2-celled; ovules anatropous, 1 or more in each cell; style filiform, sometimes bifid. Fruit a loculicidal capsule, often elastically dehiscent. Seeds ovoid or compressed, usually hard, seated on up-curved horny processes of the placenta, often clothed with white elastic hairs which are best seen when wetted.

Analysis of the Genera.

Corolla-lobes subequal, twisted to the left in bud;
fertile stamens usually 4.

Capsule 6-8-seeded, seeds discoid.

Capsule 2-4-seeded, seeds much compressed.

Corolla 2-lipped, lobes imbricate in bud; fertile
stamens 2.

Corolla tubular, slightly lipped; capsule
12-14-seeded.

Corolla broad-campanulate, deeply lipped;
capsule 4-seeded.

1. *ÆCHMANTHERA*.

2. *STROBILANTHES*.

3. *PHLOGACANTHUS*.

4. *ADHATODA*.

1. *Æchmanthera*, Nees; G. P. n. 38.1. *Æ. tomentosa*, Nees; Fl. Br. Ind. iv. 428.

A small shrub. *Leaves* 3-5 by 2 in., broad-lanceolate, acuminate, slightly crenate, coarsely pubescent; base rounded; petiole 1-1.5 in. *Flowers* in clusters of 3-8, arranged in axillary and terminal trichotomously-branched panicles. *Bracts* .5 in. long; bracteoles narrow. *Sepals* .5 in. long, linear, usually viscous. *Corolla* purple, 1 in. long, tubular-ventricose, nearly straight, suddenly widening near the middle; segments rounded, twisted in bud. *Stamens* 4, didynamous; anthers obtuse. *Capsules* .3-.5 in. long, narrow-oblong, 8-seeded. *Seeds* apparently glabrous, but are seen covered with white weak hairs when wetted.

Top of the SIWALIKS and OUTER HIMALAYAN slopes 3,500 ft.: Málkôt, above Rájpur, etc. Also in inner valleys in JAUNSAIR and TEHRI-GARHWAL, e.g. Dhárágádh, Lúnágádh, etc.

Fl. Dec., Jan. at intervals of 5 (?) years when the plant dies in the same way as some *Strobilanthes*. It thus died over a large area in the Lúnágádh valley in TEHRI-GARHWAL in the spring of 1900.

Var. *Wallichii*, Nees; Vern. *Bair-ra*, *Bharará*, Málkôt;—has stems covered with dense snow-white wool, and leaves with silky tomentum which is of a delicate purple colour, at least when young. It flowers gregariously after 4 or 5 years and dies as soon as the seeds are mature. Outer slopes of the HIMALAYA: Málkôt forest. Also Ámláwa valley in JAUNSAIR and in the SIWALIKS, e.g., behind Sháhjahánpur, and in the Timli and Mohand Passes.

2. *Strobilanthes*, Blume; G. P. n. 59.

Small shrubs or herbs. *Leaves* frequently unequal, toothed or subentire, often with raphides. *Flowers* in axillary or terminal spikes or panicles. *Bracts* deciduous or persistent; bracteoles small or 0. *Calyx* usually deeply 5-fid; segments narrow, equal or unequal. *Corolla* tubular-ventricose, curved or straight; lobes 5, subequal, twisted in bud. *Stamens* 4 and didynamous, or 2. *Capsule* 4-2-seeded. *Seeds* compressed, hairy or glabrous; hairs elastic when wetted.

Analysis of the Species.

Flowers in spikes; (leaves never quite glabrous.)

Spikes with scale-like imbricate bracts;

leaves sessile, auriculate 1. *S. auriculatus*.

Spikes without imbricate bracts.

Spikes 1-sided; leaves elliptic, the upper cordate.

Sepals linear, glabrous; corolla nearly straight. 6. *S. Wallichii*.

Sepals obtuse, hairy; corolla much curved 7. *S. atropurpureus*.

Spikes symmetrical; leaves elliptic, none ever cordate 5. *S. angustifrons*.

Spikes paniced; leaves ovate, with usually a cordate or rounded base 4. *S. alatus*.

Flowers in pedunculate heads; (leaves acuminate at both ends.)

Leaves glabrous; calyx pubescent 2. *S. pentstemonoides*.

Leaves hairy; calyx generally glabrous 3. *S. Dalhousianus*.

1. ***S. auriculatus***, Nees; Fl. Br. Ind. iv. 453.

A small shrub; branches quadrangular, often zigzag. *Leaves* variable and often very unequal in the same pair, from 10 by 2·25 in. to 3 by 1·5 in., sessile, auriculate, serrulate, sparsely hairy above. *Spikes* 3-4 by 5 in., mostly terminal, solitary. *Bracts* broader than long, 2·3 in. long, persistent, with aromatic glandular hairs. *Calyx* velvety; segments 2·3 in., unequal. *Corolla* 1 in., bluish-purple, curved; tube short, narrow; limb slightly 2-lipped. *Capsule* glabrous, 4-seeded, 3 in. long; seeds elastically hairy.

Throughout the DŪN and on the OUTER HIMALAYAN slopes up to 4,000 ft. Very common at Lachiwāla.

Fl. Nov.-Mar.

2. ***S. pentstemonoides***, T. Anders.; Fl. Br. Ind. iv. 460.

A much-branched glabrous shrub. *Leaves* 5-8 by 1·5-2·5 in., elliptic, acuminate at both ends, closely serrate; nerves 7 pairs; base decurrent into the petiole; petiole 5-2 in. *Flowers* in buds in globose heads enclosed in white concave bracts 2·5-5 in. long, usually 3 heads to a peduncle. *Calyx* pubescent; lobes linear, 2·3 in. long. *Corolla* 1·5 in. long, curved, pale-purple. *Capsule* 7 in., clavate, 4-seeded; seeds ovate, silky, 1 in. long.

Banks of the Ré-nadi in the DŪN; OUTER HIMALAYAN VALLEYS, e.g. Mussoorie, and probably up to 6,000 ft. in JAUNSAIR.

Fl. Rainy season.

3. **S. Dalhousianus**, Clarke; Fl. Br. Ind. iv. 460.

A suberect shrub, 2-3 ft. high; stems hairy. *Leaves* 4-6 by 1-3-2 in., elliptic, acuminate, hairy; petiole 5-1-5 in. long. *Bracts* as in the last species but shorter than the heads. *Calyx* usually glabrous, subscarious; lobes linear-oblong. *Corolla-tube* yellow, 1-1-5 in. long, somewhat narrowed at the neck; limb oblique, purple; lobes rounded, emarginate, one much larger than the others. *Capsule* 5-6 in. long, 4-seeded.

HILLS 6,-8,000 ft. Fairly common.

Fl. Rainy season.

4. **S. alatus**, Nees; Fl. Br. Ind. iv. 464. Vern. *Mashnoi*, *Lálor*, Jaunsar.

A small shrub; branches quadrangular. *Leaves* 4-6 by 2-3 in., ovate, acute or acuminate, crenate or serrate; nerves 7-9 pairs, 4-5 pairs crowded near the base; base cordate or rounded; petiole 1-3 in., often slightly winged; upper leaves sessile. *Spikes* forming terminal panicles. *Bracts* caducous. *Sepals* 3-4 in., ligulate, unequal. *Corolla* about 1 in. long, purple, campanulately ventricose, curved beyond the calyx, with 2 hairy lines within. *Capsule* narrow, 7-5 in. long, elliptic, hairy, 4-seeded; seeds ovate, hairy, 3 in. long.

JAUNSAR and TEHRI-GARHWAL, above 6,000 ft.: Deoban, Konáin, Mundáli, Deotá.

Fl. Rainy season.

5. **S. angustifrons**, Clarke; Fl. Br. Ind. iv. 466.

A small shrub with terete branches; old stems glabrous, young parts, inflorescence and leaves white-tomentose. *Leaves* 3-4 by 1-5-2 in., elliptic, acuminate at both ends, glabrescent, pale beneath; nerves 6 pairs; petiole 5-7 in.; upper leaves never cordate. *Spikes* terminating in small heads and forming short irregular panicles. *Bracteoles* 1 in., linear. *Calyx* linear, 3-5 in. long, pubescent. *Corolla* about 1 in. long, purple, nearly glabrous, narrow; mouth curved. *Capsule* 3-5 in. long, 4-seeded; seeds hairy, 1 in. long.

Common in the DÚN and on the OUTER HIMALAYAN slopes, up to 6,000 ft.: Lachiwála, Rájpur, Málköt.

Fl. Jan.-Mar.

6. **S. Wallichii**, Nees; Fl. Br. Ind. iv. 471. Vern. *Jánú*, or *Zánú*, Jaunsar.

A small shrub with quadrangular stems; upper portion herbaceous and renewed every year. *Leaves* 3-5 by 1-2 in., elliptic, acuminate, glabrescent, crenate-serrate; nerves 6-8 pairs; base acute; petiole 1-1-5 in.; upper leaves sessile, cordate. *Spikes* 1-6 in., one-sided. *Flowers* blue, usually in pairs. *Bracts* gradually smaller, persistent. *Sepals* ligulate, often with glandular hairs, 3 in. long. *Corolla* 1-1-5 in. long, nearly straight, very gradually ventricose;



segments round. *Capsule* linear, 5·7 in. long; seeds 4, 1 in. long, suborbicular, brown-pubescent.

JAUNSAR and TEHRI-GARHWAL, 7, 10,000 ft.; very common.

This plant is remarkable for its gregarious and exclusive habit, and is a pest in places where reproduction of tree species is needed. Its upper portion is herbaceous, and grows and dies every year, adding only one internode to the stumpy lower portion which thus goes on growing until there are about 12 internodes. It then flowers, and dies as soon as the seeds are mature. It is known to have flowered in Jaunsar in 1882 and also in 1894, giving a cycle of 12 years. On the last occasion, the seeds did not germinate until March 1896, but by the end of May all old *Strobilanthes* areas were seen thickly covered with a young crop of seedlings of its own and also of a species of *Impatiens*, which usurped the soil when the *Strobilanthes* had died. Being an annual, the former, however, is being gradually ousted by the latter.

The leaves and young shoots are greedily browsed by sheep and goats.

Fl. Rainy season at intervals of 12 years. Fr. Sept., Oct.

7. *S. atropurpureus*, Nees; Fl. Br. Ind. iv. 472.

A perennial shrub often growing in swamps; stem 1·5 ft. high, succulent. *Leaves* 2·5-4 by 1·2 in., ovate, acuminate, crenate-serrate, the upper cuneate, petioléd or decurrent to the base, very membranous. *Spikes* lax; flowers solitary or paired; lower bracts leaf-like. *Sepals* linear, subobtuse, hairy. *Corolla* 1·5-2 in. long, much curved, blue; ventricle very broad. *Capsule* about 1 in. long; seeds 2 in. long.

Fairly common in damp localities in the HILLS.

Fl. Aug.-Oct.

3. *Phlogacanthus*, Nees; G. P. n. 70.

1. ***P. thyrsoiflorus*, Nees; Fl. Br. Ind. iv. 512; Gamble Man. Ind. Timb. 281.**

An evergreen shrub up to 8 ft. high; bark smooth, grey; branches 4-angled. *Leaves* 6-8 by 1·5-3 in., lanceolate or oblanceolate, tapering at both ends, subentire, glabrous, deep glossy-green, densely punctulate; petiole 7-1 in. *Inflorescence* a terminal thyrusus up to 12 in. long. *Bracts* 2 in., linear. *Calyx* deeply 5-fid; tube 1 in. long; segments 2·3 in. long, bristle-like, pubescent. *Corolla* tubular, orange to brick-red, villous; tube curved upwards; upper lip sub-erect. *Fertile stamens* 2. *Capsule* 1·1-2 by 1 in., 4-cornered, glabrous, 12-14-seeded; seeds compressed, covered with elastic hairs.



Dadlacanthus.]

60. ACANTHACEÆ.

Common in the DÚN, on the OUTER HIMALAYAN slopes up to 4,000 ft., and also in ravines in the SAHÁRANPUR DIVISION, e.g., Bádsháhibágh and Dholkhand ráus. Always in shady moist localities.

Often cultivated in gardens for its flower and deep-green glossy foliage.

Fl. Feb.-Apr. Fr. Apr.-June.

4. *Adhatoda*, Nees; *G. P. n.* 98.

1. *A. Vasica*, Nees; Fl. Br. Ind. iv. 540; Gamble Man. Ind. Timb. 281. Vern. *Bánsá*, Dún; *Árúsá*, Hinp.; *Vásiká*, Sans.

An evergreen and gregarious shrub with a fetid smell. *Leaves* 4-8 by 1-5-3 in., lanceolate or elliptic, acute at both ends, minutely pubescent especially when young; lateral nerves 8-12 pairs; petiole 1-1-5 in. *Inflorescence* a dense short pedunculate bracteate spike, 2-4 in. long. *Bracts* 7 by 5 in., ovate or obovate, sessile; bracteoles, 7 by 2 in. *Calyx* 3-5 in. long, deeply 5-lobed; lobes equal, lanceolate. *Corolla-tube* 3-5 in. broad, white, lower portion short and barrel-shaped; lower lip with two lines of oblique purple bars. *Stamens* 2; filaments dilated; anther-cells acute at the apex, scarcely spurred at the base. *Capsule* 7 in., clavate, longitudinally channelled, pubescent, 4-seeded; seeds 2 in. long, glabrous, tubercled.

Exceedingly common in the DÚN and SAHÁRANPUR DIVISIONS and also found in JAUNSAÍ in valleys, up to 4,000 ft.,—generally in moist or shady localities, and always remarkably gregarious.

The leaves are considered valuable in native medicine as a specific for cough and asthma. They are mixed with manure in the Punjab, presumably to keep off injurious insects. The flowers are used as a medicine for asthma and ophthalmia. The wood is white, moderately hard and very even-grained. It is used for gunpowder charcoal, and is turned into beads in Bengal. Every part of the plant is exceedingly bitter. Horses seem to be fond of the leaves.

Fl. Dec.-Apr. Fr. Feb.-May.

Among other plants of this large and widely diffused Family, the following deserve mention :—

1. *Petalidium barlerioides*, Nees; Fl. Br. Ind. iv. 416;—is an undershrub, but occasionally fairly tall. *Leaves* 2-4 in. long, acuminate, crenate, grey-pubescent. *Flowers* subsessile, solitary or crowded, 1 in. long, yellowish-white. *Stamens* 4, didynamous. *Capsule* 5 in. long, compressed. Not uncommon along the banks of the Jumná, e.g., near Ámbári. Fl. Mar.-May.—*G. P. n.* 19.

2. *Dadlacanthus nervosus*, T. Anders.; Fl. Br. Ind. iv, 418.—*Leaves* often 8 by 4 in., ovate, acuminate, obscurely crenulate, glabrous. *Flowers* 1-5 in. long, blue, glabrous, in compound bracteate spikes; *corolla-tube* long and narrow; *stamens* 2. Common in the



EASTERN DÚN and elsewhere, up to 3,000 ft. Fl. Feb., Mar.—G. P. n. 23.

3. *Barleria cristata*, Linn.; Fl. Br. Ind. iv. 488. A diffuse undershrub, yellow-hairy. Leaves 3-4 by 1 in., elliptic, entire, yellow-hairy beneath. Flowers 1½ in. long, purple-blue or white. Sepals in 2 pairs, outer pair much the larger, toothed, spinescent. Fl. cold season. Common in shady places up to 3,000 ft.—G. P. n. 48.

4. *Barleria strigosa*, Willd.; Fl. Br. Ind. iv. 489.—Leaves larger than those of the preceding species, ovate, acute, long-decurrent. Flowers 1½-2 in. long, blue; outer sepals 1 in., nervose, obscurely mucronate-serrulate. Fl. Cold season. Fairly common in the DÚN.

ORDER 61. VERBENACEÆ; G. P. N. 125.

Herbs, shrubs, or trees. Leaves opposite or whorled, simple or digitate, very rarely pinnate; stipules none. Flowers irregular, rarely regular, usually bisexual, in bracteate, simple or panicled cymes. Calyx 5-4-toothed, persistent, often enlarged in fruit, sometimes coloured. Corolla gamopetalous, more or less oblique, 2-lipped or subequally 5-lobed. Stamens usually 4, rarely more or fewer, didynamous or rarely equal. Ovary superior, 2-carpellary, 2-4-celled, usually 1 ovule in each cell; style terminal; stigma usually 2-lobed. Fruit a dry or fleshy drupe with 1-4 1-seeded pyrenes, rarely a 4-seeded capsule; seeds exalbuminous.

Analysis of the Genera.

- | | |
|---|------------------|
| Corolla regular, 4-lobed; stamens equal; (drupe with 4 pyrenes.) | 1. CALLICARPA. |
| Corolla 2-lipped, 5-or 4-lobed; stamens didynamous. | |
| Drupe with 1 pyrene. | |
| Leaves simple. | |
| Flowers very small, white. | 2. PREMNA. |
| Flowers large, yellow. | 3. GMEIINA. |
| Leaves digitate; (flowers less than ½ inch) | 4. VITEX. |
| Drupe with 4 pyrenes; leaves simple. | |
| Drupe succulent; calyx usually coloured and enlarged in fruit | 5. CLERODENDRON. |
| Drupe dry; calyx not enlarged in fruit. | |
| Calyx broadly salver-shaped, scarcely lobed, coloured like corolla. | 6. HOLMSKIOLDIA. |
| Calyx small, turbinate, deeply 5-lobed, not coloured | 7. CARYOPTERIS. |

1. *Callicarpa*, Linn.; G. P. n. 37.

1. ***C. macrophylla***, Vahl; Fl. Br. Ind. iv. 568; Brandis For. Flora 368. Vern. *Daiá*, Dún and Garhwal.

A shrub with straggling branches; extremities thickly woolly-tomentose. *Leaves* 6-10 in. long, ovate or ovate-lanceolate, acuminate, closely crenate, glabrescent above, thickly cottony-tomentose beneath; lateral nerves 12-15 pairs; petiole 3-5 in. *Inflorescence* a dense-flowered globose axillary cyme. *Flowers* small, pale rose-coloured. *Calyx* .05 in., minutely 4-lobed. *Corolla* tubular, regular, about 1 in. long. *Stamens* 4, equal; anthers small, exserted. *Ovary* 4-celled. *Drupe* white, spongy-succulent outside.

Swampy localities in the DÚN, e.g., Nakraunda, Misirwála, Kálúwála, Khairi, and ravines along the base of the HIMALAYA.

Wood soft. The heated leaves are applied as a cure or relief in rheumatism by villagers.

Fl. Rainy season. Fr. Cold season.

2. *Premna*, Linn.; G. P. n. 42.

Trees or shrubs. *Leaves* opposite, simple, entire or toothed. *Cymes* terminal, paniced or corymbose; bracts small. *Flowers* often polygamous, greenish or yellowish-white. *Calyx* 2-lipped or campanulately truncate or 2-5-toothed, often enlarged in fruit. *Corolla* short, tubular; limb 2-lipped. *Stamens* 4, more or less didynamous. *Ovary* 2- or 4-celled, 4-ovuled. *Drupe* small, globose or ovoid, supported by the persistent calyx; endocarp undivided, 1-4-celled, 1-4-seeded.

Analysis of the Species.

- | | |
|---|--------------------------|
| Leaves short-petioled; calyx 5-toothed, much enlarged in fruit. | 1. <i>P. latifolia</i> . |
| Leaves long-petioled; calyx 4-toothed, not enlarged in fruit. | 2. <i>P. barbata</i> . |

1. ***P. latifolia***, Roxb.; Fl. Br. Ind. iv. 577; Brandis For. Flora 266; Gamble Man. Ind. Timb. 294. Vern. *Bakár*, Dún; *Bakárchá*, Garhwal.

A small tree with greyish-white bark. *Leaves* 3-5 by 2-3 in ovate, cuneate or rounded, less frequently shallowly cordate and then



61. VERBENACEÆ.

[*Premna*.]

slightly decurrent at the base, acuminate, undulate, usually entire, softly pubescent, ashy-grey beneath; lateral nerves 7 pairs; petiole .3-8 in. *Corymb* villous. *Calyx* .08 in., in fruit up to .2 in. *Corolla* about .15 in., throat hairy. *Drupe* .16 in., globose, black when dry.

Var. *mucronata*, Roxb. — differs from the type in having leaves with a cuneate base and longer acumen, corymbs rather flat-topped, and drupes more verrucose. It attains considerable size in damp localities.

The type is not found in the SCHOOL CIRCLE, but the variety is fairly common in the outskirts of Sál forests in the DÚN, and also in the scrub forests of the SAHÁRANPUR DIVISION and low valleys in the HILLS: Phándowála, Lachiwála, Ámbári, Ránipur, Bámsu Depôt, etc.

Wood moderately hard, light-purple or pink when fresh-cut, considered a good fuel and is used to obtain fire by friction; weight 38-43 lbs. per c. ft.

Leafless Feb.-Apr. Fl. Apr.-June. Fr. Cold season.

2. ***P. barbata***, Wall.; Fl. Br. Ind. iv. 579; Brandis For. Flora. 367. Vern. *Bakár*, Dún; *Bakárchá*, Garhwal

A small tree with grey bark. *Leaves* 5-6 by 2.5-3.5 in., oblong or ovate, acuminate, rounded or subcordate at the base, usually distinctly but very distantly toothed above the middle, softly pubescent when young, afterwards glabrescent; lateral nerves 6 pairs; petiole 1-2 in. long. *Corymbs* 1-2.5 in. diam., glabrate in fruit. *Calyx* .08 in. long, 4-toothed; teeth obtuse, not enlarged in fruit. *Corolla* .1-2 in. long, 2-lipped, hairy in the throat. *Drupe* .2 in., globose, obscurely verrucose.

OUTER HIMALAYA, up to 5,000 ft.: Jharipáni, Rájpur, Kálsi, etc. Also in the SIWALIK TRACT.

Fl. Apr., May. Fr. Cold season.

P. herbacea, Roxb.; Fl. Br. Ind. iv. 581, is a small inconspicuous undershrub, produced annually from a woody rootstock after the jungle fires. *Leaves* sessile, 4 by 2-3 in., cuneate, or obovate, serrate, pubescent. *Flowers* greenish-white, 4-lobed. *Drupe* .25 in. diam., globose. Grass-lands in the DÚN.

3. *Gmelina*, Linn.; G. P. n. 45.

1. ***G. arborea***, Linn.; Fl. Br. Ind. iv. 581; Brandis For. Flora 364; Gamble Man. Ind. Timb. 295. Vern. *Gambhár*, *Gumhár*, *Gambhár*, *Kumbhár*, *Khamhár*, Hind.

A middle-sized or large deciduous tree; bark grey or greyish-brown, smooth, exfoliating in scurfy flakes; branchlets with white peels. *Leaves* 4-8 by 3-6 in., broad-ovate, cordate with a shortly-



crenate glandular base, acute or acuminate, entire, finely tomentose and glaucous beneath; lateral nerves 6-10 pairs, straight, the lowest pair sub-basal and penniveined with 4-6 strong secondary nerves on either side; intermediate nerves straight, transverse with the main nerves; petiole 3-6 in., obscurely channelled above. (The leaves somewhat resemble those of *Trewia nudiflora*, Linn., which, however, are glabrous and have 5 arcuate basal nerves, besides other differences.) *Inflorescence* a terminal panicle with opposite decussate cymose branches. *Calyx* 2 in. *Corolla* 1-1.5 in. long, 2-lipped, oblique, brownish-yellow, densely soft-tomentose outside; lobes 5 or 4. *Stamens* 4, didynamous. *Ovary* 4-celled, 4-ovuled; style slender, unequally bifid. *Drupe* ovoid or oblong, .7-1 in. long; pericarp leathery, shining, yellow outside when ripe; endocarp bony, embedded in an aromatic sweetish pulp; seeds usually 1 to 3, lenticular, .2-.3 in. long.

Occasional in mixed forests in the DÚN, in shady localities in those of SAHÁRANPUR, and in the LOWER HILLS and up to 4,000 ft. in valleys in the HIMALAYAS.

Wood yellowish or greyish-white, close and even-grained, soft, light, but strong and durable, does not warp or split, and takes a fine glossy polish; weight 30-40 lbs. per c. ft.; no distinct heartwood. It is excellent for carpentry, but little used in the DÚN. The fruit, root and bark are used in native medicine, the former being also edible.

Fls. with new leaves in Mar., Apr. Fr. May, June.

4. *Vitex*, Linn.; G. P. n. 46.

1. *V. Negundo*, Linn.; Fl. Br. Ind. iv. 583; Brandis For. Flora 369; Gamble Man. Ind. Timb. 297. Vern. *Shimálú*, *Sumálú*, *Chhátimal*, *Nishinda*, DÚN; *Sonái*, Jaunsar; *Mallá*, Saháranpur.

A deciduous shrub with thin grey bark and spreading branches. *Leaves* 3-5-foliolate (simple and more distinctly crenate on luxuriant young shoots), with a raised line across the stem at the base of the petioles. *Leaflets* lanceolate, 1-5 by .3-1.3 in., the lowest pair smallest, sessile or subsessile, the middle pair, if present, more or less distinctly petiolulate, the odd leaflet largest and with a petiolule .3-.6 in. long, entire or distantly crenate above the middle, glabrescent above, grey-pubescent beneath. *Panicles* up to 12 in. long. *Calyx* .1-1.5 in., 5-toothed. *Corolla* .2-.5 in., bluish or purplish-white; limb spreading, 2-lipped, 5-lobed, middle lobe of the lower lip the largest. *Stamens* 4, didynamous, exerted. *Ovary* 2-4-celled, 4-ovuled; style filiform, shortly 2-lobed. *Fruit* a succulent drupe supported by the more or less accrescent calyx, 15-.25 in. diam., globose, black when ripe; endocarp normally 4-celled.

Common throughout the DÚN and SAHÁRANPUR DIVISIONS, and planted in hedge rows in villages. Also in valleys in the HILLS.



61. VERBENACEÆ.

[Vitea.]

The roots and leaves are used in native medicine, and the branches and twigs for basket-making.

Fl. June-Aug. Fr. Cold season.

There seem to be two distinct forms of this species,—one as described above, and the other a somewhat smaller shrub, with leaves more generally crenate, and panicles, flowers and drupes generally much smaller. This latter flowers later, and is perhaps more common about DEHEA. Is this var. *incisa*, Lam.?

5. Clerodendron, Linn.; G. P. n. 49.

Shrubs or small trees, rarely herbs. *Leaves* simple, opposite or whorled. *Calyx* 5-toothed or -lobed, usually enlarged in fruit and coloured. *Corolla-tube* slender; limb spreading, 2-lipped or more or less obliquely 5-lobed. *Stamens* 4, often long-exserted. *Ovary* 4-celled, 1 ovule in each cell; style filiform, bifid at the apex. *Fruit* a dry or succulent drupe, often lobed.

Analysis of the Species.

Corolla-tube less than 1 in. long.

Leaves subsessile, narrow. 1. *C. serratum*.

Leaves long-petioled, broad. 2. *C. infortunatum*.

Corolla-tube 3-4 in. long (leaves subsessile, very narrow). 3. *C. Siphonanthus*.

1. ***C. serratum***, Spreng.; Fl. Br. Ind. iv. 592; Brandis For. Flora 364; Gamble Man. Ind. Timb. 299. Vern. *Banbákri*, Jaunsar.

A shrub with annual shoots from a thick woody rootstock. *Leaves* opposite or in whorls of 3, 4-8 by 1.5-2.5 in., oblong, elliptic-oblong or oblanceolate, serrate, smooth, puberulous or glabrate; base cuneate; petiole 0.2 in. long. *Flowers* bluish-white, in terminal panicles; bracts 5-1.5, obovate or lanceolate, often coloured; pedicels 0.25 in. *Calyx* cup-shaped, .2 in. long, shortly 5-lobed. *Corolla-tube* .3-.5 in. long, narrow-cylindrical, slightly constricted at the neck, hairy within; mouth oblique, 2-lipped; lobes .3-.5 in., oblong. *Stamens* hairy at the base. *Drupe* .3 in. across, black; pyrenes up to 4.

TEHRI-GARHWAL, 3,500 ft., generally on grassy hill-sides and fire-traces: Thadiár, Bámsu, Moltá, Sendrá, etc.

Fl. May-Aug. Fr. Sept.-Nov.



2. **C. infortunatum**, Gærtn.; Fl. Br. Ind. iv. 594; Brandis For. Flora 363; Gamble Man. Ind. Timb. 299. Vern. *Karú*, Dún; *Bhánt*, Hind.

A deciduous shrub up to 12 ft. high; bark with large grey raised corky lenticels; every part of the plant very bitter and with a fetid smell. *Leaves* opposite, 4-9 by 3-6 in., broad-ovate, acuminate, sometimes slightly cordate, entire or obscurely denticulate, roughly hairy above, tomentose or thinly hairy beneath; petiole 1-6 in. *Panicles* terminal, hairy; branches and calyx reddening in fruit. *Calyx* deeply 5-cleft, lobes lanceolate, 3-4 in. in flower, 8-1 in. deep-red and leathery in fruit. *Corolla* white, tinged with red; tube cylindrical, 7-9 in. long; lobes elliptic, acute, 3-5 in. long. *Stamens* exceeding the corolla-lobes. *Drupe* fleshy, somewhat tetragonal, rather depressed, bluish-black when ripe, enclosed in the accrescent leathery calyx.

Very common as an undershrub in Sál areas where the leaf-canopy is not open enough for grass, both in the DÚN and SAHÁRANPUR DIVISIONS.

The bitter leaves and bark are used in native medicine.

Fl. Jan.-Apr. Fr. Rainy season.

3. **C. Siphonanthus**, Br.; Fl. Br. Ind. iv. 595; Brandis For. Flora 364; Gamble Man. Ind. Timb. 299. Vern. *Chingári*, Dún.

A shrub 4-8 ft. high, with herbaceous fluted hollow stems. *Leaves* in whorls of 3-5, 6-9 by 1-1.5 in., narrow-lanceolate, sub-entire, glabrous, rather hard; petiole 0-2 in. *Flowers* white fading into yellow, in rigid terminal panicles 9-18 in. long; pedicels 5-1.5 in. *Calyx* 5 in. long, dark-red, enlarged in fruit; segments oblong, acute. *Corolla-tube* 3-4 by 2 in., drooping; lobes 5-7 in. long, obovate-oblong. *Drupe* ovoid, dark-blue, about 5 in. long, supported by the spreading red calyx.

Fairly common in grass-lands in the DÚN: Raipur, Lachiwála, Rámgarh, Dehra, etc. Often cultivated in gardens for its flower.

Sections of the hollow stem are tied round the neck in Bengal as a charm against various ailments.

Fl. July, Aug. Fr. Cold season.

6. *Holmskioldia*, Retz.; G. P. n. 50.

1. **H. sanguinea**, Retz.; Fl. Br. Ind. iv. 596; Brandis For. Flora 370. Vern. *Rithoul*, E. Dún.

A large straggling shrub. *Leaves* opposite, 3-4 by 2-3 in., ovate, acuminate, generally crenate, pubescent; main lateral nerves



about 6 pairs; base truncately cuneate; petiole 5-1.2 in. long. *Calyx* 7-1 in. across, salver-shaped, membranous, red-orange, entire or with a wavy margin. *Corolla-tube* 6-1 in. long, cylindrical, curved, bright-red; limb unequally 5-lobed. *Stamens* 4, didynamous; filaments glabrous; anthers exserted. *Ovary* 4-celled, 4-ovuled; style shortly bifid, glabrous. *Drupe* 2-3 in. long, obovoid, deeply 4-lobed at the apex; seeds 1-4, oblong.

Outer slopes and foot of the HIMALAYA and shady ravines in the DÚN, : Tháno, Kálimatti, Ráipur, etc.; also passes in the DÚN side of the SIWALIKS. Cultivated in gardens at DEHRA.

Fl. Oct.-Dec.

7. *Caryopteris*, Bunge; G. P. n. 52.

Spreading shrubs; extremities pubescent or tomentose. *Leaves* opposite, simple, acuminate, minutely gland-dotted. *Cymes* small, dense, axillary or running into a terminal thyrus; bracts small. *Flowers* light-mauve, generally pubescent. *Calyx* 5-fid; segments somewhat accrescent in fruit. *Corolla-tube* short; limb spreading, 2-lipped, middle lobe of the lower lip largest, much crisped. *Stamens* 4, didynamous; anthers exserted. *Ovary* 4-celled, 4-ovuled; style filiform, usually much exserted, shortly bifid. *Fruit* a small globose capsule; valves 4, induplicate, 1-seeded; seeds oblong, erect.

Analysis of the Species.

Cymes mostly in terminal thyrus; calyx-segments in fruit lanceolate, erect, ribbed . . . 1. *C. Wallichiana*.

Cymes mostly axillary and corymbose; calyx-segments in fruit triangular, spreading, not ribbed 2. *C. grata*.

1. ***C. Wallichiana***, Schauer; Fl. Br. Ind. iv. 597; Brandis For. Flora 370. Vern. Chingári, Karui, Dún.

A large shrub with quadrangular branches; bark peeling off in long papery strips; young shoots grey-pubescent. *Leaves* up to 4 by 1.5 in., narrow-elliptic or lanceolate, acuminate, toothed or nearly entire, puberulous; base cuneate; petiole 3-5 in. *Flowers* sweet-scented, light-mauve, in dense axillary cymes forming thyrus at the ends of the branches. *Calyx* deeply 5 lobed; lobes in fruit erect, lanceolate, ribbed.

Corolla-tube 2·3 in. long; lobes slightly larger than the tube, the lower middle one bluish, others white. *Style* more than twice the length of the corolla. *Fruit* 2 in. long, globose, densely pubescent.

Common in ravines and on waste lands in the DUN and LOWER HILLS, up to Saia in JAUNSAK.

Fl. Mar., Apr. Fr. May, June.

2. *C. grata*, Benth.; Fl. Br. Ind. iv. 597.

A rambling shrub; branches brown-pubescent. *Leaves* 3-5 by 1·8 in., those near the cymes much smaller, elliptic, acuminate, crenate-serrate or subentire, pubescent; lateral nerves about 8 pairs in the larger leaves; base rhomboid or almost rounded; petiole 3·6 in. *Cymes* mostly axillary, densely rusty-pubescent, dichotomously corymbose, few-flowered. *Calyx* membranous, pubescent, triangular in fruit, not ribbed. *Corolla* about 3 in. long, faintly bluish, pubescent, glandular. *Style* about twice the length of the corolla. *Capsule* 15·2 in. diam., globose, slightly ribbed, nearly glabrous.

JAUNSAK and TEHRI-GARHWAL, up to 5,000 ft.—Jharipani below Mussoorie, Saiaji, Chattragadh, Khunigadh, etc.

Fl. Jan.-Apr. Fr. May-July.

The following belonging to this Family deserve notice:—

Lantana Camara, Linn.; Fl. Br. Ind. iv. 562;—is a small weedy shrub with recurved prickles on the branches, apparently wild and found in hedges in DEHRA. *Leaves* opposite, simple, up to 3 in. long, rugose. *Flowers* about 5 in. long, sweet-scented, in peduncled capitate spikes which are 1·1·5 in. diam. *Corolla-tube* pink or red; lobes orange or yellow. *Drupe* purple when ripe. Fl. Rainy season. —G. P. n. 18.

Lantana indica, Roxb.; Fl. Br. Ind. iv. 562;—is very similar in appearance and found in the same places, but has no recurved prickles, and the flowers are smaller and not so strongly scented. *Corolla* pink, red, yellow or white. Fl. Rainy season.

Verbena bonariensis, Linn.; Fl. Br. Ind. iv. 565;—is another weed which is a native of Brazil, but is found near Mothronwala in the DUN. *Leaves* sessile, 3-4 by 5·6 in., nervose, serrate. *Flower-spikes* in terminal corymbs. Fl. Aug., Sept.—G. P. n. 26.

Tectona grandis, Linn.; Fl. Br. Ind. iv. 570. The Teak. Vern. Saigun, Hind.;—is the most important timber tree of South India and Burma and has a larger export trade than any other Indian timber. *Leaves* opposite, over a foot long, entire, with strong nerves. *Flowers* whitish, small, very numerous, in large terminal cyme-bearing



panicles. *Calyx* very small in flower, but much enlarged, membranous and ovoid in fruit. *Corolla* 2 in. long, equally 5-lobed. *Drupe* hirsute, with a hard bony 4-celled endocarp. The tree is fast-growing and long-lived and attains large dimensions. The wood, taken all round, is the best in India and perhaps also in the world, being used for almost all conceivable purposes, and exclusively for ship-building and railway-cars where available. Weight about 40 lbs. per c. ft. Cultivated in DEHRA DŪN and SAHÁRANPUR, but young plants suffer much from frost.
—G. P. n. 40.

ORDER 62. LABIATÆ; G. P. N. 126.

Herbs, rarely shrubs, usually with aromatic oil-glands; stem quadrangular. *Leaves* opposite or whorled; stipules none. *Flowers* irregular, in whorls which are either simple, or in simple or paniced spikes. *Calyx* persistent, sometimes enlarged in fruit, 4-5-lobed or 2-lipped. *Corolla* 4-5-lobed or 2-lipped; lobes imbricate in bud. *Stamens* 4, didynamous, the upper pair sometimes imperfect. *Disk* prominent. *Ovary* 4-lobed, 4-celled; ovules solitary in each cell, erect; style gynobasic, simple; stigma usually 2-fid. *Fruit* of 4 usually-dry 1-seeded nutlets included in the persistent calyx.

A Family of very little forest importance in India, but containing many herbaceous plants of value for food, medicine, perfume, etc.

Analysis of the Genera.

Whorls of flowers in terminal paniced spikes; calyx not reticulate.

Calyx-teeth long, feathery in fruit; nutlets hairy 1. COLEBROOKIA.

Calyx-teeth short, naked; nutlets shining, tubercled 2. ELSHOLTZIA.

Whorls of flowers simple, axillary; calyx strongly reticulate; nutlets smooth. 3. ROYLEA.

1. Colebrookia, Smith; G. P. n. 25.

1. *C. oppositifolia*, Smith; Fl. Br. Ind. iv. 642; Gamble Man. Ind. Timb. 300. Vern. *Bindá*, *Bindú*, Dún and Garhwal; *Lálri*, *Bambher*, Jaunsar; *Kálá Bánsá*, *Bintá-lakri*, Saháranpur.

A hoary shrub, under favourable circumstances up to 20 ft. high, with grey bark. *Leaves* opposite, 4-10 by 1.5-3 in., oblong-elliptic, acuminate, crenate, softly tomentose; lateral nerves 12-15 pairs, arcuate; petiole .5-1 in., stout, white-felted. *Spikes* 2-4 in. long, in many-branched panicles, very numerous, hoary in fruit. *Flowers* about 1 in. long, in congested clusters at varying distances on the rachis. *Calyx* very small, villous; tube much grooved; lobes elongate. *Corolla* white; lobes rounded. *Stamens* 4, usually exserted; anther-lobes round. *Style* 2-fid; lobes subulate. *Nutlets* hairy, obovoid.

Common along ravines and ráus in the DÚN and SAHÁRANPUR DIVISIONS, and also in low valleys in JAUNSAIR and the OUTER HIMALAYA, up to 4,500 ft.: Silgádh, Binálgádh, Sansáru-Khálá, etc.

The wood weighs 46 lbs. per c. ft. It is used for gun-powder charcoal. The leaves are applied on wounds and sores.

Fl. Jan., Feb. The fruit-spikes remain long on the plants, almost throughout the year.

2. Elsholtzia, Willd.; G. P. n. 27.

1. **E. polystachya**, Benth.; Fl. Br. Ind. iv. 643; Gamble Man. Ind. Timb. 301. Vern. *Pathoi*, *Pothá*, Jaunsar.

A shrub up to 8 ft. in height, with grey fibrous bark which peels off in long strips. *Leaves* opposite, 3-6 in. long, elliptic-lanceolate, acuminate, serrate or crenate, pubescent, subsessile or minutely petioled. *Flowers* minute, spicate. *Spikes* 4-10 in. long, flowering .3 in. diam., narrower in fruit, strongly aromatic. *Fruiting calyx* tubular, ribbed, .1 in. long; teeth 5, erect, triangular. *Corolla* white, pubescent; limb 4-fid. *Stamens* 4, exserted, divergent. *Style* subequally 2-fid. *Nutlets* oblong.

Fairly common in JAUNSAIR and TEHRI-GARHWAL, up to 9,500 ft., associated with *Indigoferas* in open grassy slopes.

Fl. Aug.-Oct. Fr. Cold season, but remains long on the plant.

3. Roylea, Wall.; G. P. n. 110.

1. **R. elegans**, Wall.; Fl. Br. Ind. iv. 679; Gamble Man. Ind. Timb. 301. Vern. *Karánoi*, Jaunsar; *Títpáti*, Garhwal.

A woody undershrub with grey bark. *Leaves* opposite, 1-2 in. long, ovate, crenately toothed, tomentose beneath; petiole about .2 in. long. *Flowers* in 6-10-flowered axillary whorls. *Calyx* 5-lobed, 10-ribbed, rigid. *Fruiting calyx* .5-.7 in. long, lobes as long as the tube. *Corolla* .5 in., white with a touch of pink, 2-lipped;



upper lip erect, lower spreading; tube narrow. *Stamens* 4, ascending. *Stigma* subequally 2-lipped. *Nutlets* 1 in. long, obovoid-oblong, smooth.

OUTER HIMALAYA, JAUNSAAR and TEHRI-GARHWAL, up to 5,000 ft. : Málkôt, Rájpur, Saia, Dhárágádh, Thadiár, etc.

The leaves, which are extremely bitter, are used as a febrifuge by the Jaunsaris.

Fl. Mar., Apr. Fr. Apr., May.

The Túlsi Plant (*Ocimum sanctum*, Linn.), the Common Mint, Vern. *Pudiná*, Hind. (*Mentha sativa*, Linn.), and Peppermint (*M. piperita*, Linn.) belong to this Family. They are cultivated in gardens in SAHÁBANPUR and the DÚN, and also found wild, probably as escapes, e.g., *Pudiná* at Sahansra-dhárá, and *Túlsi* at Rikhi-kesh and Kasúmri.

Plectranthus rugosus, Wall., Fl. Br. Ind. iv. 620, Vern. *Chichli*, Jaunsar;—is a small shrub very common on bare hill-sides throughout the HILLS about 4,700 ft. e.g., Bámsu, Dhárágádh, the Sacred Forest at Kôti, etc. *Leaves* 5-1 in. long, ovate, crenate, rugose. *Flowers* bluish or purplish-white.—*G. P. n. 11.*

Plectranthus ternifolius, Don., Fl. Br. Ind. iv. 621;—is a rigid shrub 5-6 ft. high, found at Karwápáni, Lachiwála, etc. in the DÚN, also at Nonái in TEHRI-GARHWAL (*Mr. J. S. Gamble*). *Leaves* 4-6 by 1-1.3 in., lanceolate, densely tomentose; regularly serrate; petiole 1-2 in. *Flowers* white outside, sessile, in dense long white villous panicles.

Pogostemon plectranthoides, Desf.; Fl. Br. Ind. iv. 632;—is a gregarious bush having a strong mint-like smell; stems dark purple, with a large pith. *Leaves* 3-7 by 1.5-3 in., ovate, acuminate, doubly serrate, membranous, pubescent; lateral nerves very arching; petiole 1-3 in. long. *Flowers* white or pink, in large terminal paniced bracteate spikes. Common in shady ravines in the DÚN, e.g., Kánsráo, Tháno, etc. The smell of the bruised leaves is said to cure ague. Fl. Rainy season.—*G. P. n. 23.*

Pogostemon parviflorus, Benth.; Fl. Br. Ind. iv. 632; closely resembles the above, but is usually a smaller plant, less hairy, with stems darker purple, and spikes shorter and more densely flowered. Common in ravines up to 4,000 ft. in the HILLS. The leaves are chewed and poulticed on snake-bites.—Fl. Cold season.

Meriandra strobilifera, Benth.; Fl. Br. Ind. iv. 652; occurs in dry rocky places about Dúngri (6,700 ft.) in JAUNSAAR. *Leaves* 3-4 in. long, oblong, coriaceous, very rugose, usually with a sagittate base. *Spikes* with woody bracts in fruit.—*G. P. n. 67.*



APETALÆ.

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ORDER 63. AMARANTACEÆ; G. P. N. 130.

HERBS, rarely shrubs. *Leaves* generally alternate, exstipulate. *Flowers* small, occasionally unisexual, in spikes cymes or clusters, supported by scarious bracts and a pair of bracteoles. *Sepals* 5, scarious, persistent. *Petals* 0. *Stamens* 1-5, opposite the sepals. *Ovary* 1-celled. *Fruit* usually a utricle, rarely a berry or a capsule. *Seed* orbicular or ovate, compressed; testa crustaceous.

A weedy Family, not of any forest interest.

Analysis of the Genera.

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|------------------------------------|---------------|
| Rambling shrubs; seeds few or many | 1. DEERINGIA. |
| Erect shrubs; seed solitary | 2. BOSIA. |

1. *Deeringia*, Br.; G. P. n. 1.

1. *D. celosioides*, Br.; Fl. Br. Ind. iv. 714; Gamble M Ind. Timb. 302. Vern. *Chúndri*, Dún; *Latman*, Hind.

A small shrub, very conspicuous when in fruit. *Leaves* alternate, up to 4 in. long, ovate or ovate-lanceolate, gradually diminishing in size towards the ends of the branches; base more or rounded; petiole 2-1 in. *Spikes* 6-12 in. long, terminal, peduncled. *Flowers* 2 in. diam., greenish-white, very shortly pedicellate. *Fruit* oblong, spreading in fruit. *Stamens* 4-5. *Fruit* a berry, 2-lobed, scarlet and filled with a frothy pink juice when ripe.

Common in hedges and scrub-forests in the DÚN. shoots and leaves are good for fodder, and are said to encourage flow of milk in milch cows. The juice of the ripe fruit is a substitute for red ink.

Fl. Sept., Oct. Fr. Dec., Jan.

2. *Bosia*, Linn.; G. P. n. 7.

1. *B. Amherstiana*, Hook. f.; Fl. Br. Ind. iv. 714. Syn.—*Rodetia Amherstiana*, Moq.; Gamble Man. Ind. Timb. 302. Vern. *Bhengoi*, Jaunsar.

A glabrous struggling shrub. *Leaves* alternate, 3-6 by 1-3 in. ovate, acute or acuminate, glabrous; base more or less acute; petiole 2-7 in. long. *Spikes* both axillary and terminal, never exceeding 7 in.



63. AMARANTACEÆ.

[*Bosia*.]

leaves. Flowers 2 in. diam., 5-merous, green, in compound racemes or spikes. Sepals concave. Bracts and bracteoles green, with white margins. Stamens 5. Stigmas sessile. Fruit a berry, 15 in. diam., globose, crimson when ripe; seeds with a crustaceous testa.

Fairly common in the Tons valley and other hot valleys in JAUNSAH.

The leaves dry black, and a black dye is obtained from them. The young shoots are eaten fried in ghee. The ripe berries are also eaten. Wood soft, very porous.

Fl. Apr, July. Fr. July, Oct.

ORDER 64. PIPERACEÆ; G. P. N. 139.

Aromatic herbs or shrubs, generally prostrate. Leaves alternate, opposite or whorled, entire, often punctate, stipulate or exstipulate. Flowers in congested spikes, supported by peltate bracts. Perianth 0. Fruit small; seeds with copious mealy albumen.

This is a Family of no forest interest in North-Western India, but deserves mention as comprising such plants as *Piper longum*, Linn., Verr. *Pipil*, and *P. Betle*, Linn., the well-known *Pán*. The following species are found in the SCHOOL CIRCLE:—

1. *Houttuynia cordata*, Thunb.; Fl. Br. Ind. v. 78.—A small plant with a creeping rootstock. Leaves broadly ovate, cordate; stipules membranous. Bracts over 5 in. long, petaloid. Occasionally met with in hot damp localities in JAUNSAH and TEHRI-GARHWAL, Dhármigádh, Khúnigádh, etc. Fl. Apr.-June.—G. P. n. 3.

2. *Piper brachystachyum*, Wall.; Fl. Br. Ind. v. 87.—A twiggly shrub with somewhat woody branches. Leaves 3-7 in., thin, elliptic or ovate-lanceolate, 5-nerved; base acute; 2-5 in. Fruiting spikes globose or slightly oblong, leaf-peduncles never exceeding the spikes. Fruit 1 in. diam. up localities, e.g., banks of the Ré-nadi, DEHRA DÚN, and in TEHRI-GARHWAL.—G. P. n. 5.

ORDER 35. LAURINEÆ; G. P. N. 143.

Trees or shrubs, more or less aromatic. Leaves usually alternate, simple, exstipulate, generally entire, gland-dotted. Flowers 1-2-sexual, regular. Perianth inferior, 6-4-cleft; segments imbricate in bud; tube



sometimes enlarged in fruit. *Stamens* up to 12, in 2-4 series, usually half or more wanting or reduced to staminodes; filaments flattened and often with 2 glands at the base; anthers 2-4-celled, cells opening by up-curved deciduous valves. *Ovary* superior, 1-celled; ovule solitary, pendulous. *Fruit* a 1-seeded berry or drupe; peduncle often thickened; seed pendulous, exalbuminous.

Analysis of the Genera.

- Flowers paniculate, usually bisexual; anthers of the inner stamens opening outwards.
- Fruit supported only by the base of the perianth. 1. CINNAMOMUM.
- Fruit supported by the entire perianth.
- Perianth-segments spreading or reflexed, not stiffened 2. MACHILUS.
- Perianth-segments clasping the fruit and stiffened 3. PHCEB.
- Flowers umbellate, usually dioecious, anthers all opening inwards 4. LITSEÆ.

1. Cinnamomum, Blume; G. P. n. 16.

1. **C. Tamala**, Fr. Nees; Fl. Br. Ind. v. 128; Brandis For. Flora 374; Gamble Man. Ind. Timb. 306. Vern. *Dálchini*, *Dár-chini*, Hind.; *Gúr-ándrá*, Jaunsar.

A moderate-sized tree, with thin dark-brown wrinkled bark. *Leaves* both alternate and opposite sometimes on the same twig, 4-6 by 1.5-2.5 in., ovate-oblong, acute or acuminate, 3-nerved, glabrous, shining above, pink when young. *Panicles* scarcely exceeding the leaves. *Perianth* of 6 unequal segments, silky-pubescent; lobes longitudinally ribbed, ovate-oblong, breaking off transversely about the middle in fruit. *Perfect stamens* 9, the 6 outer eglandular with 4-celled anthers opening inwards, the inner three with 2 glands at the base and 4-2-celled anthers opening outwards; innermost or fourth series of 3 short staminodes. *Ovary* free; style filiform. *Drupe* .5 in. long, ovoid, succulent, supported by the thickened peduncle and the 6-toothed or truncate base of the perianth, black when ripe.

Occurs sporadically in damp ravines in JAUNSAAR and TEHRI-GARHWAL, up to 6,000 ft.: Thadiár, Bagúr-nálá, Málkot, etc. Very common and almost gregarious in the Mautárgádh.

The wood is moderately hard and close-grained, but is liable to split and warp; weight 39 lbs. per c. ft. The bark of the twigs is used as a substitute for the true cinnamon, which is obtained from



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cogener of this tree (*C. zeylanicum*, Breyn.) and the leaves are the bay-leaves or *Tejpát* of Indian commerce.

New leaves Apr., May. Fl. Feb.-May. Fr. June-Oct., but remaining long on the tree.

The Camphor tree, *C. Camphora*, Linn.; Fl. Br. Ind. v. 134;—is cultivated for ornament in the DÚN, where it thrives well on good soil and is well worth cultivating in plantations on a commercial scale to produce camphor—a very valuable and important product.

2. *Machilus*, Nees; G. P. n. 17.

Evergreen trees. *Leaves* alternate, penniveined. *Flowers* bisexual, in axillary and terminal panicles. *Perianth* divided to the base; segments 6, persistent but unchanged in fruit. *Stamens* as in *Cinnamomum Tamala*; anthers all 4-celled. *Berry* globose or oblong, seated on the spreading or reflexed perianth.

Analysis of the Species.

Leaves ovate-acuminate, short; (fruit globose) 1. *M. Gamblei*.

Leaves ovate-lanceolate, long.

Fls. quite glabrous; fr. oblong or ellipsoid. 2. *M. odoratissima*.

Fls. silky-tomentose; fr. globose or nearly so. 3. *M. Duthiei*.

1. *M. Gamblei*, King mss.; Fl. Br. Ind. v. 138, 860.

A moderate-sized tree; bark dark-grey, with even surface. *Leaves* 3-5 by 1-1.5 in., obovate to elliptic-lanceolate, acute or acuminate, entire, thinly coriaceous, glabrous and shining above, glaucous beneath; base cuneately acute; lateral nerves 8-10 pairs, slender; petioles .5 in. long, slender, glabrous or pubescent. *Panicles* terminal, lax, few-flowered. *Perianth-lobes* linear-oblong, villous within. *Filaments* slender, almost glabrous; anthers oblong. *Fruit* .3 in. diam., globose, black when ripe.

Fairly common in shady and swampy localities in the DÚN: Káluwála, Rámgarh, Mothronwála, Karwápáni, etc.

Wood white, appears to be soft.

Fl. Mar., Apr. Fr. June, July.

2. *M. odoratissima*, Nees; Fl. Br. Ind. v. 139, 859; Brandis For. Flora 378; Gamble Man. Ind. Timb. 308. Vern. *Káwalá*, *Jaunsar*; *Káulá*, *Kaulu*, Dún.



A middle-sized tree. *Leaves* 4-6 by 1.5-2 in., lanceolate or oblong, acuminate, dark-green and shining above, slightly glaucous beneath, impressed-punctate, lateral nerves 7-13 pairs; petiole .5-.8 in. long. *Panicles* peduncled, shorter than the leaves. *Flowers* and *filaments* quite glabrous. *Fruit* .5-.7 in. long, oblong or ellipsoid, purple and somewhat pruinose when ripe.

JAUNSAR, TEHRI-GARHWAL and OUTER HIMALAYAN VALLEYS, 3,000-6,500 ft.

Wood light, soft and even-grained, not much used. Weight 40 lbs. per c. ft.

Fl. Mar., Apr. Fr. May, June.

3. **M. Duthiei**, King mss.; Fl. Br. Ind. v. 861. Vern.

Kāwalā, *Bhojo*, Jaunsar.

A tree larger than the last species; young branches sometimes finely silky. *Leaves* 5-10 by 1.5-2.7 in., lanceolate, oblong or oblanceolate, very coriaceous, glaucous beneath; nerves 12-20 pairs, irregular; petiole .5-1 in. *Flowers* larger than in the preceding species; perianth lobes linear-oblong, finely silky. *Filaments* glabrous. *Fruit* globose, .5 in. diam., on thickened pedicels.

Common in shady ravines in the HILLS, 5,000-7,500 ft.

Fl. Apr., May. Fr. June, July.

In the description of the last two species I have followed the revised sketch given at the end of volume V of the 'Flora of British India,' but there are specimens in the School Herbarium which do not exactly fall under any of them. The fruit character, however, is the most reliable of all, and the trees can easily be distinguished in the forest from the colour of their foliage and the shape and general appearance of their crowns. Besides, they generally occur in somewhat different localities.

3. *Phœbe*, Nees; G. P. n. 18. (*Persea*).

1. **P. lanceolata**, Nees; Fl. Br. Ind. v. 141; Brandis For. Flora 377; Gamble Man. Ind. Timb. 308. Vern. *Bhadroi*, *Bhadeu*, Jaunsar; *Tímri*, Dún.

A small evergreen tree with yellowish-white bark. *Leaves* alternate, crowded at the ends of the branches, 5-8 by 1-2 in., narrow-lanceolate, finely or caudate-acuminate, glabrous; lateral nerves 6-10 pairs; petiole .5-.8 in. *Flowers* 2-sexual or polygamous, in lax axillary panicles. *Perianth* cup-shaped; segments obovate, scarcely acute, pubescent within, enlarging, hardening and imbricate in fruit. *Stamens* as in *Cinnamomum Tamala*; anthers all 4-celled. *Fruit* .3-.4 in. long, narrow-ellipsoidal, black when ripe, half-buried in the enlarged calyx.



65. LAURINEÆ.

[Photo.
SL

In shady damp valleys or near marshes in the DÚN: Karwá-páñi, Rámgarh, Kánsráo, Khairi; also up to 6,500 ft. in the HILLS, e.g., Sainji, Korwá, Mussoorie, etc.

The wood is white, hard and close-grained, but does not seem to have ever been used for timber purposes. Growth fast. Weight 46-55 lbs. per c. ft.

Fl. Feb.-June. Fr. June-Sept.

4. Litsæa, Lamk.; G. P. n. 28.

Usually evergreen trees or shrubs. *Leaves* alternate, often crowded at the ends of the branches, generally penninerved. *Flowers* dicecious, in few-flowered umbels; umbels sessile or pedicellate, usually clustered, supported by 4-6 concave involucral bracts. *Perianth* tubular, 4-6-lobed. *Stamens* 6, less often 9 or 12, those of the inner series with a pair of glands at the base; anthers 4-celled, all introrse. *Fruit* a drupe, seated on the much-enlarged perianth-tube, black when ripe.

Analysis of the Species.

Stamens 9 or more; leaves penninerved throughout.

Lvs. grey-tomentose beneath; fr. globose. 1. *L. sebifera*.

Lvs. rusty-tomentose beneath; fr. ovoid or oblong.

Leaves broad; receptacle of fruit very small. 2. *L. polyantha*.

Leaves narrow; receptacle of fruit large. 3. *L. elongata*.

Stamens 6; leaves 3-nerved at the base.

Leaves 6-12 in. long, thickly coriaceous. 4. *L. lanuginosa*.

Leaves 3-6 in. long, thinly coriaceous. 5. *L. umbrosa*.

1. ***L. sebifera***, Pers.; Fl. Br. Ind. v. 157. Syn.—*Tetranthera laurifolia*, Jacq.; Brandis For. Flora 379; Gamble Man. Ind. Timb. 310. Vern. *Chandni*, Dún; *Maidá-lakri*, Hind.

A moderate-sized evergreen tree with dark-grey soft corky bark; young parts grey-tomentose. *Leaves* 4-10 in. long, elliptic ovate oblong or lanceolate, acute or acuminate, pubescent or glabrescent above, grey-tomentose beneath, soft-coriaceous; lateral nerves 8-12 pairs; petiole 5-1.5 in. *Umbels* 3-6 in. diam.; pedicels clustered on a common peduncle 2-3 in. long; bracts 4, rounded, tomentose. *Stamens* 9-20, or more; filaments hairy. *Fruit* about 3 in. diam., globose, supported by the club-shaped pedicel.

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ORDER 67. ELÆAGNACEÆ; G. P. n. 147.

Shrubs or trees with silvery or brown scales. *Leaves* usually alternate, entire, exstipulate. *Flowers* regular 1-2-sexual, in axillary fascicles or cymes. *Perianth* tubular; lobes valvate in bud. *Stamens* usually 4, epiphyllous, alternating with the perianth-lobes. *Ovary* superior, 1-celled, with a solitary erect ovule. *Fruit* indehiscent, enclosed in the accrescent perianth-tube.

Analysis of the Genera.

Flowers normally 2-sexual; perianth 4-fid. 1. ELÆAGNUS.
Flowers 1-sexual, dicecious; perianth 2-partite or 2-fid. 2. HIPPOPHÆ.

1. *Elæagnus*, Linn.; G. P. n. 1.

Shrubs or small trees, sometimes spinescent. *Leaves* alternate, covered with dense silvery scales beneath. *Flowers* 2-sexual or 1-sexual by abortion. *Perianth-tube* constricted above the ovary; lobes 4, valvate, deciduous. *Stamens* 4. *Fruit* with a bony or coriaceous endocarp.

Analysis of the Species.

An erect deciduous shrub; leaves narrow; fruit
3 in. long. 1. *E. umbellata*.
A straggling evergreen shrub; leaves broad;
fruit about 1 in. long 2. *E. latifolia*.

1. *E. umbellata*, Thunb.; Fl. Br. Ind. v. 201; Brandis
For. Flora 390; Gamble Man. Ind. Timb. 318. Vern. *Ginroi*,
Jaunsar.

A thorny deciduous shrub with numerous branches, often forming a dense bush. *Leaves* 1-3 by 3-7 in., oblong or lanceolate, acute at both ends, clothed below with bright silvery scales, sparsely scaly or pubescent above; nerves indistinct; petiole 2-3 in. long. *Flowers* dull-white, silvery outside, appearing with the leaves, in small axillary clusters. *Perianth* 2 in.; lobes triangular-ovate. *Fruit* 3 in. long, oblong-ovoid, succulent, ribbed outside.

JAUNSAR, TEHRI-GARHWAL and outer slopes of the HIMALAYA, usually 3,700 ft. Between Saia and Korwa; below Konain; Dharaagadh, etc.

The fruit is eaten.

Fl. Apr.-June. Fr. Rainy season.

2. **E. latifolia**, Linn. ; Fl. Br. Ind. v. 202 ; Brandis For. Flora 390 ; Gamble Man. Ind. Timb. 317.

A straggling shrub, often spiny. *Leaves* very variable, usually 3-6 by 1·5-2·5 in., ovate-oblong, acuminate, membranous, clothed beneath with silvery or ferruginous scales ; margins often slightly undulate ; lateral nerves 6-8 pairs ; petiole 3-4 in. long, channelled. *Flowers* few or numerous, in axillary clusters ; pedicels elongated in fruit. *Perianth-lobes* broad. *Fruit* about 1 in. long, sometimes longer, elliptic-oblong or pyriform, strongly 8-ribbed, red or yellow when ripe ; endocarp silky inside.

Mothronwāla, Nakraunda and Lachiwāla swamps, DEHRA DŪN, and possibly in similar places elsewhere.

The acid but somewhat astringent fruit is eaten by villagers.

Fl. Nov.-Feb. Fr. May, June.

2. Hippophaë, Linn. ; G. P. n. 2.

1. **H. rhamnoides**, Linn. ; Fl. Br. Ind. v. 203 ; Brandis For. Flora 388 ; Gamble Man. Ind. Timb. 317. Vern. *Dhurchuk*, *Tārwa*, *Chumá*, N.-W. P.

A large thorny dioecious shrub, sometimes a small tree ; bark dark-grey, rough with vertical furrows. *Leaves* alternate, 5-2 by 1-3 in., subcoriaceous, glabrescent above, felted with grey or rust-coloured scales beneath. MALE FLS. in axillary clusters on the old wood ; *perianth* with 2 opposite segments. FEM. FLS. axillary, solitary, pedicelled ; *perianth* tubular, 2-dentate. *Fruit* oblong or globose, orange or bright-scarlet when ripe, enclosed in the succulent perianth.

UPPER TONS valley : Dátmir and Oshlá, TEHRI-GARHWAL ; chiefly in moist gravelly stream-beds.

It is used for fuel and charcoal and the dry branches for hedges. The fruit is very acid, but boiled with sugar forms a palatable preserve.

Fl. Mar., Apr. Fr. July, Aug.

Very similar in appearance and hardly specifically different is *H. salicifolia*, Don. *Leaves* membranous, covered beneath with stellate hairs and scales. Gangottari and other places in TEHRI-GARHWAL.

ORDER 68. LORANTHACEÆ ; G. P. n. 148.

Parasitic evergreen shrubs. *Leaves* generally opposite, exstipulate, entire, coriaceous. *Flowers* 1-2-sexual



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Analysis of the Genera.

- Leaves alternate, subcoriaceous, evergreen; scales and style 0. 1. *DAPHNE*.
 Leaves opposite and alternate, membranous, deciduous; scales and style present 2. *WIKSTROEMIA*.

1. *Daphne*, Linn.; G. P. n. 3.

1. ***D. cannabina***, Wall.; Fl. Br. Ind. v. 193. Syn.—*D. papyracea*, Wall.; Brandis For. Flora 386; Gamble Man. Ind. Timb. 315. The Paper *Daphne*. Vern. *Dhák Chamboi*, *Chamua*, Jaunsar; *Satpurá*, Garhwal.

An evergreen shrub, 4-6 ft. high, with smooth grey bark. Leaves 2-4 in. long, oblanceolate or narrow-lanceolate, subcoriaceous, glabrous; nerves very slender, depressed above, just visible below; petiole short, marginate, channelled. Flowers scented, white, in sessile terminal heads, supported by oblong or lanceolate hairy bracts. Perianth-tube 5-7 in. long, slender, white-pubescent outside; lobes 4, short, acute. Scales 0. Stamens 8, in two series. Stigma sessile or subsessile, capitate. Fruit 5 in. long, ovoid, orange while ripening, deep-red or ruby when fully ripe, succulent, with a coriaceous rind.

JAUNSAR and TEHRI-GARHWAL, 4,000-9,500 ft. Very common in the Korwá and Lúrlí forests.

In Nepal and Kumaon, paper is made out of the inner fibrous bark.

Fl. Mar., Apr., often also in autumn. Fr. Two months after fl.

2. *Wikstroemia*, Endl.; G. P. n. 11.

1. ***W. canescens***, Meissn.; Fl. Br. Ind. v. 195. Syn.—*W. virgata*, Meissn.; Brandis For. Flora 386; Gamble Man. Ind. Timb. 315. Vern. *Chamboi*, Jaunsar.

A small shrub with a few slender branches. Leaves 1-3 in., oblong-lanceolate, acute, membranous, often slightly pubescent; petiole 1 in. long. Flowers white or yellowish, subsessile, in few-flowered heads spikes or cymes. Perianth 3 in. long, slender, silky outside; lobes 4. Disk-scales 1-4, linear. Stamens 8, in two series. Style short; stigma large. Fruit 2 in. long, narrowly ovoid, silky.

JAUNSAR and TEHRI-GARHWAL, 5,-8,000 ft.: Deoban, Konáin, Mundáli, Kathián, Deotá.

Fl. Apr.-June. Fr. Two months after fl.

usually bracteate. *Perianth* single or double; the outer (calyx) usually adnate to the ovary, limb truncate or 0; the inner (corolla) free or connate, valvate in bud. *Stamens* as many as, and opposite to, the lobes of the inner perianth. *Ovary* inferior, 1-celled with usually one erect ovule. *Fruit* a 1-seeded drupe; albumen fleshy.

Analysis of the Genera.

Flowers 2-sexual, showy; style long. 1. LORANTHUS.
 Flowers 1-sexual, inconspicuous; style short or 0. 2. VISCUM.

1. *Loranthus*, Linn.; G. P. n. 2.

Leaves generally opposite. *Flowers* 2-sexual, usually large, showy. *Calyx* adnate to the ovary; limb entire or minutely toothed. *Petals* free or more or less connate into a tube. *Stamens* epipetalous, subequal. *Style* long, stigma capitate. *Fruit* a fleshy drupe.

Analysis of the Species.

Flowers 4-merous.
 Petals free; (leaves glabrous) 1. *L. ligustrinus*.
 Petals connate into a tube.
 Leaves scurfy on both surfaces when young;
 peduncles many-flowered.
 Corolla buff or pink 2. *L. Scurrula*.
 Corolla green 3. *L. pulverulentus*.
 Leaves always glabrous above; peduncles
 few-flowered; 4. *L. vestitus*.
 Flowers 5-merous; (leaves glabrous; petals red,
 connate into a tube) 5. *L. longiflorus*.

1. ***L. ligustrinus***, Wall.; Fl. Br. Ind. v. 207; Brandis For. Flora 395; Gamble Man. Ind. Timb. 319. Vern. *Bándá*, Hind.

A parasitic shrub, often apparently terrestrial. *Leaves* opposite, the upper sometimes alternate, 2-3·5 by ·6-1 in., lanceolate, thinly coriaceous, glabrous. *Flowers* ·3 in. long, rust-coloured or pale-pink outside, deep-red inside, in axillary panicles or racemes; bracts persistent. *Calyx*-limb entire. *Corolla*-segments linear, reflexed from the middle. *Ovary* rusty-tomentose. *Fruit* ovoid, ·2-3 in. long, brown when ripe.

Occasionally met with in the DÚN FORESTS: Rámgarh, Karwá-páni, Methronwála, etc.

Fl. May, June.



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oblanccolate, with 3-5 longitudinal basal nerves. *Flowers* diœcious, sessile, in clusters of 3-5, supported by concave bracts. *Perianth-segments* 3-4, triangular, deciduous. *Fruit* 2·3 in. long, ellipsoid, white, smooth, almost transparent.

JAUNSAE and TEHRI-GARHWAL, up to 6,000 ft. (Lambâtách), chiefly on Rosaceous shrubs, and on elm, walnut and willows.

It is used medicinally, and bird-lime is made of the viscid pulp of the fruit.

Fl. March-May. Fr. Sept.-Nov.

2. **V. articulatum**, Burm.; Fl. Br. Ind. v. 226. Syn.—*V. attenuatum*, DC.; Brandis For. Flora 394; Gamble Man. Ind. Timb. 319. Vern. *Budu*, *Pand*, Hind.

A much-branched leafless green parasite, greenish-yellow when dry. Main stem terete; branches flat, longitudinally striate and furrowed, contracted at the nodes, pendulous; internodes widening upwards, 1-2 in. long. *Flowers* sessile, in sessile 3-flowered spikes, two or several spikes at a joint. *Fruit* subglobose, 15 in. long, yellow when ripe.

The SIWALIKS and OUTER HIMALAYA, up to 6,000 ft. Found on *Cordia vestita*, *Cornus capitata*, *Pyrus Pashia*, etc.

Fl. Rainy season.

3. **V. japonicum**, Thunb.; Fl. Br. Ind. v. 226. Syn.—*V. articulatum*, Burm., Brandis For. Flora 393; Gamble Man. Ind. Timb. 319. Vern. *Pand*, *Báná*, *Bándá*, Hind.

A much-branched small tufted leafless parasite. Main stem dark-grey, terete; branches flat and much contracted at the nodes, looking much like strings of beads; internodes 2·3 in. long, linear-cuneate, usually with a middle ridge. *Inflorescence* as in *V. articulatum*. *Flowers* very minute; perianth-segments 3-4, persistent. *Fruit* 1 in. long, globose, greenish-yellow.

JAUNSAE and TEHRI-GARHWAL, up to 8,000 ft. Appears to be very partial to the Oaks, especially *Q. incana*, e.g., at Kathián. *Rhus*, *Olea*, *Rhododendron* and Apricot trees have also been known to be attacked.

Fl. May-July. Fr. Oct., Nov.

ORDER 69. SANTALACEÆ; G. P. N. 149.

Trees, shrubs, or herbs. *Leaves* alternate or opposite, simple, exstipulate, entire, sometimes wanting. *Flowers* regular, small, green, 1-2-sexual. *Perianth* generally superior, campanulate. *Stamens* opposite the



perianth-lobes. *Ovary* usually inferior, 1-celled; placenta free-central. *Fruit* a nut or a drupe; seed globose, in copious fleshy albumen.

1. *Osyris*, Linn.; G. P. n. 17.

1. *O. arborea*, Wall.; Fl. Br. Ind. v. 232; Brandis For. Flora 399; Gamble Man. Ind. Timb. 320. Vern. *Dálmi*, *Dálimá*, Garhwal and Kumaon.

A fairly large twiggy shrub; branchlets sharply 3-angled. *Leaves* alternate, 1-2 in. long, subsessile or with a short marginate petiole, obovate, elliptic-oblong or lanceolate, mucronate. *Flowers* minute, polygamous. MALE FLS. in axillary long-peduncled clusters. FEMALE FLS. usually solitary, axillary, on slender drooping pedicels. *Perianth-lobes* conical, valvate. *Ovary* inferior; placenta very short. *Drupe* sub-globose, 3 in. diam. glabrous, red when ripe.

Not uncommon in the OUTER HIMALAYA and in the SIWALIK TRACTS: Tháno, Málkôt, Rájpur, Saiá, near the watershed behind Ránipur, etc.

Wood reddish-brown, hard, compact and close-grained.

Fl. Almost throughout the year. Fr. Chiefly cold season.

This small Family is remarkable as the one to which the Sandalwood, *Santalum album*, Linn., Fl. Br. Ind. v. 231, Vern. *Chandan*, Hind., belongs. *Leaves* opposite, 2-3 in. long, elliptic-ovate. *Flowers* small, inodorous. *Fruit* a globose drupe. This most valuable tree is indigenous in Southern India, particularly in Mysore. Babu Birbal has succeeded in growing a tree in the Forest School Park at DEHRA DÚN.—G. P. n. 11.

ORDER 70. EUPHORBIACEÆ; G. P. N. 151.

Herbs, shrubs, or trees, sometimes with milky juice. *Leaves* alternate or opposite, usually stipulate, rarely compound. *Inflorescence* various. *Flowers* generally small, always unisexual. *Perianth* usually single and calycine, rarely double or wholly wanting. *Stamens* various; anthers usually 2-celled. *Ovary* generally 3-celled, rarely 1-2- or more than 3-celled; styles as many as the carpels, free or connate, entire or divided; ovules 1 or 2 in each cell, pendulous from the inner angle of the cell. *Fruit* a capsule or a drupe, rarely a



Seeds oily, usually with a copious albumen;
radicle superior; cotyledons flat.

Analysis of the Genera.

- Fleshy plants with thick branches and milky juice 1. EUPHORBIA.
- Trees or shrubs not fleshy.
- Leaves trifoliolate 10. BISCHOFIA.
- Leaves simple.
- a. Leaves large, usually over 4 in. long.
- Leaves more or less rounded at the base.
- Leaves fleshy, lobed; plants with an opaque juice. 13. JATROPHA.
- Leaves tough, not lobed; plants not juicy.
- Leaves opposite, cordate; fruit indehiscent 14. TREWIA.
- Leaves alternate, punctate; fruit a capsule.
- Lvs. orbicular, usually peltate. 16. MACARANGA.
- Lvs. ovate, not peltate. 15. MALLOTUS.
- Leaves alternate, not punctate, closely parallel veined; fruit a berry-like drupe. \ 4. BRIDELIA.*
- Leaves narrow-lanceolate, base acute.
- Leaves crenate, with milky juice.} 17. SAPIUM (*insigne*).
- Leaves entire, without milky juice. 11. DAPHNIPHYLLUM.
- b. Leaves middle-sized, usually under 4 in. long and 1 in. wide.
- Nerves many, closely parallel 4. BRIDELIA.
- Nerves few, not closely parallel.
- Leaves serrulate; fruit a tomentose drupe. 8. PUTRANJIVA.
- Leaves entire.
- Fruit a compressed drupe, pericarp fleshy. 12. ANTIDESMA.
- Fruit indehiscent, lobed, pericarp hardened. 9. CYCLOSTEMON.
- Fruit a capsule.
- Calyx valvate; cocci undivided. 17. SAPIUM (*sebiferum*).
- Calyx imbricate; cocci 2-valved.
- Styles recurved 7. FLUEGGIA.
- Styles confluent 6. GLOCHIDION.

*Bridelia leaves are very variable, sometimes large, often quite small, according to locality.



70. EUPHORBIACEÆ.

[*Euphorbia*.

SL

c. Leaves small and thick, usually not more than .5 in. wide.

Leaves alternate; fruit indehiscent . . . 2. SARCOOCOCCA.

Leaves opposite; fruit a capsule . . . 3. BUXUS.

d. Leaves very small, usually under 1 in.

by 2 in. 5. PHYLLANTHUS.

1. *Euphorbia*, Linn.; G. P. n. 2.

Herbs or soft-wooded shrubs with copious milky juice. *Leaves* alternate, with or without strong stipular prickles, sometimes opposite or whorled especially on flowering branches. *Flowers* in heads resembling single flowers, consisting of a cup-shaped involucre which encloses many male flowers and one central female flower; involucre-lobes 4-5 with thick horizontal glands at the sinuses; glands sometimes winged and petaloid. MALE FL. consists of a pedicelled articulated often bracteolate stamen; anther-cells usually globose. FEMALE FL. a pedicelled 3-celled ovary in the centre of the involucre, often protruding and recurved. *Styles* 3, free or connate, usually 2-fid. *Capsules* of 3 2-valved cocci.

Analysis of the Species.

Branches sub-cylindrical 1. *E. Nivulia*.

Branches with 5-7 prominent angles 2. *E. Royleana*.

1. ***E. Nivulia***, Ham.; Fl. Br. Ind v. 255. Brandis For. Flora 439; Gamble Man. Ind. Timb. 368. Vern. *Thor*, *Thuor*, *Dún*; *Súrú*, Jaunsar; *Seḡhár*, Hind.

A large shrub or small tree; branches in whorls of 4, fleshy, nearly cylindrical, with vertically or spirally arranged tubercles each supporting a pair of stipular prickles. *Leaves* alternate 6-12 in. long, obovate-oblong or linear; tip rounded; midrib much elevated beneath; lateral nerves indistinct. *Involucres* 3 together, central sessile male, lateral pedunculate with only male or both male and female flowers; lobes fimbriate, erect, ovate; bracteoles many. *Capsules* 3 in. diam.; seeds smooth.

Dry rocky hills in the OUTER HIMALAYA and TEHRIGARHWAL; rather rare. Cultivated at DEHRA.

Leafless in cold and dry seasons. Fl. Mar., Apr. Fr. May.



70. EUPHORBIACEÆ.

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2. **E. Royleana**, Boiss.; Fl. Br. Ind. v. 257; Brandis For. Flora 438; Gamble Man. Ind. Timb. 368. Vern. *Thor*, *Thur*, *Dún*; *Súrú*, Jaunsar; *Senhúr*, Hind.

A large milky shrub with thick fleshy 5-7-gonous branches; ridges wavy with a pair of stipular prickles at the crest of each wave. *Leaves* alternate, sessile, 4-6 in. long, spatulate, very shortly mucronate, fleshy; lateral nerves 6-8 pairs, irregularly reticulate, quite indistinct until dry. *Involucres* hemispheric, about 5 in. across, greenish-yellow, 3-4 together in axillary subsessile clusters; lobes fimbriate. *Styles* combined up to the middle. *Capsules* 6 in. diam., 3-gonous; peduncles up to 5 in. long.

OUTER HIMALAYA and valleys in JAUN SAR and TEHRI-GARHWAL, up to 5,000 ft: Málkôt, Kálsi, Saia, Tons valley (Morágádh), etc.

It grows readily from cuttings and is often planted in hedges.

Leafless throughout the cold and hot seasons. Fls. and Fr. Mar.-May.

2. *Sarcococca*, Lindl.; G. P. n. 18.

1. **S. pruniformis**, Lindl.; Fl. Br. Ind. v. 266. Syn.—*S. saligna*, Muell. Arg.; Brandis For. Flora 448; Gamble Man. Ind. Timb. 371. Vern. *Tilidri*, Jaunsar.

A small evergreen shrub. *Leaves* variable, usually 1-3 in. long, elliptic or lanceolate, quite entire, coriaceous, glabrous, shining above, often 3-nerved at the base; lateral nerves faint. *Flowers* 3 in. pale-yellow, monœcious, bracteate, in short axillary racemes, whitish decussate. *Sepals* 4, imbricate, in two series, oblong. *Stamens* 4, free, much longer than the sepals and opposite. *Ovary* 2-3-celled; ovules 2 in each cell; styles 2-3, at length. *Fruit* a berry, 3-5 in. long, ovoid, purple when ripe.

JAUN SAR and TEHRI-GARHWAL, 5,900 ft. grows in shady places.

Wood white, close-grained, moderately hard for walking sticks.

Fl. Mar.-May. Fr. June-Aug.

3. *Buxus*, Linn.; G. P. n. 19.

1. **B. sempervirens**, Linn.; Fl. Br. Ind. v. Brandis For. Flora 447; Gamble Man. Ind. Timb. 369. The Vern. *Pápri*, *Sansádu*, Jaunsar; *Chikri*, Punjab.

A small or middle-sized tree with 4 sided branchlets; bark yellowish-grey, soft, corky, fissured in crocodile-pattern on old stems. *Leaves* opposite, 1-3 by 2-4 in., linear-oblong or lanceolate, shining, glabrous; tip acute obtuse or retuse; petiole very

short. *Flowers* apetalous, monœcious, sessile, bracteate, in short congested axillary spikes. *Disk* 0. *MALE FL.*: *Sepals* 2 pairs, one inside the other and imbricating with it, yellowish. *Stamens* 4, free, opposite the sepals, exserted. *FEMALE FL.*: *Sepals* 6, in two or three series, the outer smallest, all imbricate, yellowish. *Ovary* 3-celled, with 2 ovules in each cell; *styles* 3, simple, short, thick, persistent; *stigma* 2-lobed. *Capsule* 5 in. long, ovoid, loculicidally 3-valved, wrinkled; valves dehiscing through the styles, each valve having two halves. *Seeds* oblong, trigonous, with a black shining testa and a fleshy albumen.

Jádi and Mátkágrá Blocks in the Deoban range, JAUNSAAR, and in the Jumná valley, TEHRI-GARHWAL, always in shady rocky ravines.

Boxwood is yellowish-white, hard, very close- and even-grained. Pores very small, medullary rays extremely fine, both very numerous. Annual rings distinct but narrow, the growth being very slow. Weight about 60 lbs. per c. ft. It is the nearest approach to ivory and is used for engraving, turning, carving and mathematical instruments. In India, however, it is chiefly carved into combs and various other articles, the principal market being Amritsar in the Punjab.

Fl. Mar.-May. Fr. June-Aug.

4. *Bridelia*,* Willd.; G. P. n. 22.

Trees or shrubs, sometimes climbing. *Leaves* alternate, entire, with prominent lateral nerves. *Flowers* monœcious or dioœcious, small, bracteate, in axillary (rarely spicate) clusters. *Calyx* 4-5-cleft; lobes *Petals* 5, alternating with, and smaller than, *lobes*. *MALE FL.*: *Stamens* 5, united below in the centre of a flat sinuate disk. *FEMALE* rarely 3-celled, on a cup-shaped membranously lobed. *Styles* 2, bifid. *Fruit* a soft r 1) usually indehiscent 1-seeded pyrenes.

Analysis of the Species.

- A large shrub; leaves rigidly coriaceous, with long, oblique nerves; bracteoles few, coriaceous; calyx enlarged in fruit 1. *B. retusa*.
- A small tree; leaves membranous, with more or less arcuate nerves; bracteoles numerous, membranous; calyx not enlarged in fruit 2. *B. montana*.

* Also written 'Briedelia.'

1. **B. retusa**, Spreng.; Fl. Br. Ind. v. 268; Brandis For. Flora 449; Gamble Man. Ind. Timb. 356. Vern. *Ekdániá*, *Gondni*, *Saháranpur*; *Gáyá*, *Khájá*, *Dún* and *Garhwal*.

A large or middle-sized deciduous tree, with strong spines when young; bark thin, grey or brownish-black. *Leaves* very variable, 3-6 in. long, obovate, elliptic, oblong or ovate, rigidly coriaceous, glabrous above, glabrous or glaucous beneath; lateral nerves 15-22 pairs, strong straight, parallel; petiole 2-5 in. long; stipules deciduous. *Flowers* dioecious, yellow, small, subsessile; bracts villous. *Calyx* 2 in. diam.; lobes ovate. *Petals* fleshy. *Fruit* 3 in. diam., sub-globose, green, purplish-black when ripe, supported by the somewhat enlarged calyx; pyrene generally solitary.

Throughout the *DÚN* and *SAHÁRANPUR* DIVISIONS, especially in moister parts; often associated with *Sál*.

Sapwood yellowish-white; heartwood grey or olive-brown, hard, compact, even- and close-grained, seasons well; annual rings distinct; weight about 50 lbs. per c. ft. The wood is used for carts, agricultural implements, and building. It stands well under water and might be used for well-curbs. The bark is used for tanning; the ripe fruit is sweetish and is eaten, and the leaves are used as cattle-fodder.

New leaves May, June. Fl. May-July. Fr. Oct.-Jan.

2. **B. montana**, Willd.; Fl. Br. Ind. v. 269; Brandis For. Flora 450; Gamble Man. Ind. Timb. 357. Vern. *Gondni*, *Saháranpur*.

A small or moderate-sized deciduous tree, often only a shrub, with a short trunk and a low spreading crown; bark dark-grey; branchlets warted. *Leaves* very variable, 3-6 in. long, obovate or broad-elliptic, glabrous or shining above, paler beneath; lateral nerves 10-15 pairs, more or less arched; petiole 1-3 in. long; stipules deciduous. *Flowers* monœcious (?),* small, greenish-yellow, shortly pedicelled; bracts many and crowded, membranous, pubescent. *Calyx* 1-2 in. diam.; lobes triangular ovate, unaltered in fruit. *Petals* oblanceolate. *Fruit* ovoid or globose, 2 in. long, black when ripe.

Fairly common in ravines or banks of ráus, up to 3,500 ft. Wood mottled, otherwise very similar to that of the last species, and might be used for the same purposes to the extent its smaller size would allow; weight 46-59 lbs. per c. ft. The leaves are lopped for fodder; the fruits are not eaten.

Fl. Apr., May (*Sir D. Brandis*), but Oct., Nov. (a second flush?) in the *Dún*. Fr. Nov.-Apr.

* *Fide* Fl. Br. Ind. and Brandis For. Flora; but I have seen several trees with only male, and several others with only female flowers, and, so far none with both.

5. *Phyllanthus*, Linn.; G. P. n. 34.

1. **P. Emblica**, Linn.; Fl. Br. Ind. v. 289; Brandis For. Flora 454; Gamble Man. Ind. Timb. 351. Vern. *Aonlá*, *Amlá*, *Aolá*, Hind.

A moderate-sized deciduous tree; bark grey, exfoliating in irregular patches; red inside; branchlets finely pubescent. *Leaves* 3-5 in. long, subsessile, linear-oblong, acute or mucronate, distichously close-set on deciduous branchlets, together having the appearance of pinnate leaves; stipules minute. *Flowers* apetalous, monœcious, greenish-yellow, in axillary clusters. **MALE FL.**: numerous and shortly pedicellate. *Stamens* 3, joined in a short column. *Disk* of distinct glands, alternating with the calyx-segments, rarely 0. **FEMALE FL.**: *Sepals* as in the male flowers. *Ovary* 3-celled, with 2 ovules in each cell; styles 3, connate at the base, twice bifid. *Fruit* of 3 2-valved cocci, 5-7 in. diam., obscurely 6-lobed, globose, fleshy, pale-yellow, dehiscent only when dry.

Throughout the DÚN and SAHÁRANPUR DIVISIONS, and up to 4,500 ft. in JAUNSAH and TEHRI-GARHWAL; very common.

Wood red, hard and close-grained, but warps and splits in seasoning; it is however durable under water, and yields charcoal of excellent quality. Heartwood and annual rings not distinct; weight about 50 lbs. per c. ft. The bark and fruit are used in medicine and also for tanning. The fruit is eaten raw or pickled, and is believed to be good for biliousness.

Leafless Feb.-Apr. Fl. Mar.-May. Fr. Cold season.

6. *Glochidion*, Forst.; G. P. n. 34.

(Placed under *Phyllanthus* in the "Genera Plantarum.")

Evergreen trees or shrubs. *Leaves* alternate, bifarious, entire. *Flowers* usually monœcious, apetalous, small. **MALE FL.**: *Sepals* 6, imbricate, in two series. *Anthers* 3-8, connate into a column; connectives produced. *Disk* without glands. **FEMALE FL.**: *Calyx* of 5-6 free or connate sepals. *Ovary* 3-15-celled; ovules two in each cell. *Styles* variously united in a column. *Capsule* of 3 or more 2-valved cocci, quite globular or depressed, generally more or less lobed. *Seeds* hemispherical, albuminous.

Analysis of the Species.

Leaves glabrous; anthers 4-6; branchlets angular. 1. *G. lanceolarium*.
 Leaves velvety; anthers 3; branchlets terete. 2. *G. velutinum*.

1. ***G. lanceolarium***, Dalz.; Fl. Br. Ind. v. 308. Syn.—
Phyllanthus lanceolarius, Muell. Arg.; Brandis For. Flora 453;
 Gamble Man. Ind. Timb. 351.

A glabrous tree about 25 ft. high; bark grey, with longitudinal wrinkles. Leaves 4-6 in. long, elliptic-oblong or lanceolate, acuminate, coriaceous, glabrous, shining; lateral nerves 6-10 pairs; base acute; petiole channelled, 2-4 in. long; stipules triangular. Flowers pale-green, in axillary fascicles, male numerous and long-pedicelled, female few, sessile or shortly pedicelled. MALE FL.: *Calyx* of 6 linear-oblong segments. *Anthers* 4-6, oblong, on a short column. FEMALE FL. smaller; *Calyx* of 6 acute, rigid, unequal segments. *Ovary* 6-8-celled, villous. *Styles* 6, connate into a glabrous conical column. *Capsules* 3-5 in. diam., depressed, 8-lobed.

Fairly common in moist localities in the WESTERN DÚN: Nichlá Súwá Block, Kánsráu, Nakraunda, etc.

The wood is believed to be hard and durable.

Fl. Cold season. Fr. Mar.-May (?).

2. ***G. velutinum***, Wight; Fl. Br. Ind. v. 322. Syn.—
Phyllanthus nepalensis, Muell. Arg.; Brandis For. Flora 452; Gamble Man. Ind. Timb. 351. Vern. Anwin, Jaunsar; Chamári, Dún; Kath Mauwá, Garhwal.

A small tree, tomentose throughout. Leaves 2-5 in. long, ovate, elliptic or oblong, rather coriaceous, glabrate above; lateral nerves 4-6 pairs; base rounded or obtuse; petiole 1-15 in. long; stipules subulate. Flowers in axillary fascicles,—the male on long slender pedicels, the female subsessile. *Calyx* of 6 segments, hairy outside. MALE FL.: *Anthers* 3, oblong; connective prolonged. FEMALE FL. densely clustered. *Styles* connate into a cylindrical column. *Capsules* 3-5 in. diam., depressed, usually 4-celled and deeply 8-lobed.

Common in the DÚN and SAHÁRANPUR FORESTS, also in low valleys (Tons, etc.) in JAUNSAAR and TEHRI GARHWAL.

Wood brownish-white, compact. The bark is used for tanning.

Fl. Feb.-Apr. Fr. June-Aug.

7. *Flueggea*, Willd.; G. P. n. 38.

1. ***F. microcarpa***, Blume; Fl. Br. Ind. v. 328. Syn.—
Securinega obovata, Muell. Arg.; Brandis For. Flora 455; Gamble Man. Ind. Timb. 354. Vern. Rithoul, Dún.

A small tree with rusty or reddish-brown thin bark and angular branchlets marked with small white specks; branches straight and regularly fluted. *Leaves* very variable, 1-4 in. long, elliptic ovate obovate or orbicular, membranous but tough, rather glaucous beneath; tip rounded obtuse or acute, rarely acuminate or retuse; lateral nerves 6-8 pairs, very slender; petiole .1-3 in. long, slender. *Flowers* diœcious, very small, pedicelled; usually in axillary fascicles. *Sepals* 5, imbricate. **MALE FL.:** *Stamens* 5, alternating with disk-glands but opposite to the sepals; pistillode large, 3-fid. **FEMALE FL.:** *Ovary* ovoid, on an annular disk; styles 3, 2-fid. *Fruit* of two sizes, mostly small and dry, about .1-15 in. diam., with a few large ones .3 in. diam., which are white and fleshy; seeds 3-6, punctate.

Very common along the foot of the SIWALIKS in the SAHĀRANPUR DIVISION, especially towards the west, and generally in scrub forests in the DŪN: Shāhjahānpur, Kasūmri, Barkálá; Lachiwála, Gularghāti, Káunli, etc.

Wood reddish-white, close-grained, strong and durable, used for agricultural implements; weight 52 lbs. per c. ft. The branches make handsome walking-sticks, and are much used for the frame-work of thatched roofs as a substitute for bamboos. The bark is astringent, and is used to intoxicate fish.

Fl. Apr., May. Fr. Sept.-Nov.

8. Putranjiva, Wall.; G. P. n. 41.

1. **P. Roxburghii**, Wall.; Fl. Br. Ind. v. 336; Brandis For. Flora 451; Gamble Man. Ind. Timb. 353. Vern. *Jiápútá*, *Páti-jíá*, Hind.

A handsome evergreen tree generally with pendent branches; branchlets slender, pubescent; bark dark-grey, almost smooth, marked with horizontal lines of white specks. *Leaves* alternate, 2-4 in. long, elliptic-oblong, acute or acuminate, serrulate, rarely entire, glabrous, shining, dark-green; main lateral nerves 8-10 pairs besides secondary nerves and reticulate veins; petiole .2-3 in. long, pubescent; stipules subulate, deciduous. *Flowers* diœcious, small, yellow; male short-pedicelled in axillary clusters which are often spicate; female long-pedicelled, axillary, solitary or in twos or threes. *Calyx* 3-5-cleft; segments imbricate. *Stamens* 3; filaments more or less connate. *Ovary* tomentose, 3-celled; styles 3; stigmas crescent-shaped. *Fruit* .5 in. long, obovoid or globose, white-tomentose; putamen very hard.

In moist shady mixed forests in the DŪN and SAHĀRANPUR DIVISIONS, especially on the banks of the Suswá below Kánsráu; Khairi swamp, Rikhikesh, Gularparáo, Barkálá, Kasūmri, etc.

Wood light-grey, even-grained, shining, moderately hard, fairly durable; weight 50 lbs. per c. ft. Used for tools and turning. The

leaves are used for cattle-fodder, and the nuts are strung up in rosaries and tied round children's neck to keep off disease, and also worn by women during pregnancy to prevent abortion.

New leaves in April. Fl. Apr., May. Fr. Cold season.

9. *Cyclostemon*, Blume; G. P. n. 45.

1. **C. assamicus**, Hook. f.; Fl. Br. Ind. v. 342. Vern. *Chipla*, Dún; *Khadbehulá*, Kumaun.

A very handsome small evergreen tree with smooth greenish-grey thin bark and slender branchlets. *Leaves* 3-5 in. long, ovate or elliptic-oblong, dark-green, quite glabrous and shining; margins entire but undulate; nerves 10-12 pairs, slender; petiole 2-3 in. *Flowers* axillary, diœcious, apetalous, shortly pedicellate. *Sepals* usually 4, imbricate. MALE FL.: *Stamens* about 12; filaments free. FEM FL.: *Ovary* generally 2-celled; stigmas sessile, fleshy, spreading, light-brown, liable to get chipped off in drying. *Young fruit* 3 in. diam., brownish-grey-tomentose, chartaceous, more or less distinctly lobed. Mature fruit and seed not seen.

Found in the Nakraunda and Mothronwála swamps, 1,900 ft., in the Dún, and identified as the above by Major Prain.

The wood is greyish-white, moderately heavy, hard, tough and even-grained, with distinct rings; no heartwood. The leaves are eaten by cattle.

Fl. Nov., Dec. Fr. From Jan.

10. *Bischofia*,* Blume; G. P. n. 53.

1. **B. javanica**, Bl.; Fl. Br. Ind. v. 345; Brandis For. Flora 446; Gamble Man. Ind. Timb. 355. Vern. *Pániála*, Western Dún; *Bhillár*, Málköt; *Kot Semlá*, Káen, Garhwal.

A large tree with a dark-brown bark exfoliating in angular scales. *Leaves* alternate, 3-foliolate, variable in size; common petiole 2-6 in. long. *Leaflets* 3-5, 1.5-3 in., ovate or ovate-oblong, acuminate, crenate; petiolule of lateral leaflets about .5 in. long. *Inflorescence* a much-branched terminal panicle. MALE FL. minute; *sepals* 5, concave, obtuse, enclosing the stamens and opposite to them. FEMALE FL. 2 in. diam.; *sepals* ovate, caducous. *Ovary* exserted, 3-celled, with two ovules in each cell; styles long, entire. *Fruit* a globose berry .5 in. diam., brown when fully ripe, supported on the thickened pedicels.

Shady ravines and in swampy localities in the Dún and OUTER HIMALAYA: Karwápáni, Lachiwála, Nakraunda, Khairi swamp, Káluwála, Sansáru Khála, Málköt Hills, etc.



Wood red, moderately hard, but rough-grained; heartwood of a darker colour, small. Weight 40-50 lbs. per c. ft. Little known in the Dún, but is used for all kinds of construction and for boat-building in other parts of India, notably East Bengal and Assam.

New leaves Feb., Mar. Fl. Apr., May. Fr. Cold season.

11. *Daphniphyllum*, Blume; G. P. n. 57.

1. *D. himalayense*, Muell. Arg.; Fl. Br. Ind. v. 354. Gamble Man. Ind. Timb. 348. Vern. *Ratendú*, Jaunsar.

A small tree with stout trunk and branches. *Leaves* alternate, 6-8 in. long, linear-oblong or oblong-lanceolate, acute or acuminate, entire, glabrous and shining above, glaucous beneath; petiole 1.5-2 in. long. *Flowers* dioecious, apetalous, in 3-4 in. long axillary racemes., *Sepals* 3-8, small, deciduous in the female fl. *Stamens* 5; anthers, apiculate. *Ovary* imperfectly 2-celled, cells 2-ovuled; styles short or stigmas sessile, distinct, recurved. *Fruit* an oblong drupe, .5-.6 in. long; seed with a membranous testa, albuminous.

Found in shady ravines at and near MUSSOORIE, and in the OUTER HIMALAYAS, e.g., Málköt. Also in JAUNSAAR, 5,700 ft.; Dárná, Mátkágrá, Baináná, etc.

Wood pale-brown, fine and close-grained, pores minute, medullary rays numerous and fine; weight about 40 lbs. per c. ft.; wood of the roots is of a deep red colour and capable of being used for ornamental purposes.

Fl. Mar., Apr. Fr. June-Aug.

12. *Antidesma*, Linn.; G. P. n. 60.

1. *A. diandrum*, Roth; Fl. Br. Ind. v. 361; Brandis For. Flora 447; Gamble Man. Ind. Timb. 350. Vern. *Ámli*, *Imli*, *Káli Khatái*, Dún.

A low shrub (or small tree?) with smooth grey bark and low spreading crown; branchlets rusty-tomentose. *Leaves* alternate, 2-5 by 1-2 in., ovate, oblong or ovate-lanceolate, acute or acuminate, quite entire, glabrous and shining above, turning deep-red before falling; nerves faint, rusty-pubescent beneath; petiole .1 in., pubescent; stipules lanceolate. *Flowers* dioecious, apetalous, greenish-yellow, very small, in slender terminal racemes. *Calyx* cup-shaped, 5-toothed. *Stamens* generally two, filaments free, as long as the pedicels; disk lobed. *Ovary* 1-celled; stigma bifid. *Fruit* a compressed drupe, .2 in. diam., of a pleasant acid taste and purplish-red when ripe.

Fairly common in Sál forests and on the outskirts of *tappars* in the DÚN, up to 2,500 ft.; less so in the SAHÁRANPUR DIVISION.



Wood pinkish-grey, hard, close-grained, weighing 41 lbs. per c. ft. The acid leaves are greedily eaten by coolies when thirsty, and are made into *chutni*. The fruit also is eaten.

New leaves Apr., May. Fl. May, June. Fr. Dec., Jan.

13. *Jatropha*, Linn.; G. P. n. 79.

1. **J. Curcas**, Linn.; Fl. Br. Ind. v. 383; Gamble Man. Ind. Timb. 365. Vern. *Safed Arand*, Hind.

A shrub or small tree with a short irregular trunk; young shoots glandular tomentose, with opaque saponaceous juice; bark grey, smooth, peeling off in thin papery flakes. *Leaves* 4-6 by 3-5 in., broadly cordate, usually palmately 5-lobed; petiole 3-9 in. long. *Flowers* yellowish, monœcious, in terminal or sub-terminal cymes. *Sepals* 5, imbricate, slightly puberulous, often coloured. *Corolla* tubular, pale-yellow, villous within; limb 5-lobed. *Stamens* 10, in two series; filaments of the inner series connate. *Ovary* 3-celled. *Styles* 3, glabrous. *Fruit* about 7 in. long, 3-lobed, oblong; seeds oblong, large, dark-brown, smooth.

Planted in hedge-rows in the DÚN and SAHÁRANPUR DISTRICTS and often growing wild as an escape. The juice of the twigs gives a soapy lather, believed to do good if applied on sores. The oil of the seeds is medicinal.

Fl. and Fr. throughout the year.

14. *Trewia*, Linn.; G. P. n. 144.

1. **T. nudiflora**, Linn.; Fl. Br. Ind. v. 423; Brandis For. Flora 443; Gamble Man. Ind. Timb. 359. Vern. *Gambár* (which is also the name for *Gmelina arborea*), *Támri*, Dún; *Dhaul-pedda* (white tree), Saháranpur.

A middle-sized deciduous tree with smooth grey bark. *Leaves* 6-9 by 4-5-7 in., cordate or broad-ovate, glabrous, 3-5 nerved at the base; petiole 2-4 in. long, terete. *Flowers* pale-green, in axillary racemes, appearing before the leaves; MALE in fascicles of 3-4, each supported by a bract, in lax interrupted racemes 4-9 in. long; FEMALE long-pedicellate, solitary or in few-flowered racemes. *Calyx* in the MALE FL. globose, splitting into 3-4 concave segments; in the FEMALE FL. of 3-5 imbricate sepals. *Disk* 0. *Stamens* free, numerous. *Ovary* cottony, 3-4-celled, cells 1-ovuled; styles connate at the base, about 1 in. long, covered with papillose stigmas throughout. *Fruit* a berry, 1-1.3 in. diam., globose, depressed, smooth; mesocarp not harder than potato.

Damp places and ravines in the DÚN and SAHÁRANPUR DIVISIONS: Lachiwála, Nakraunda, Káláwála, banks of the Jumná, Kánsráu and other passes, etc.



70. EUPHORBIACEÆ.

[*Tremula*.]

Wood white, soft, fairly elastic, but not durable; weight 28-29 lbs. per c. ft. Used for native drums, and for yokes in Western Bengal.

Leafless Jan.-Mar. New leaves Mar., Apr. Fl. Feb.-Apr. Fr. Cold season.

15. Mallotus, Lour.; G. P. n. 146.

1. **M. philippinensis**, Muell. Arg.; Fl. Br. Ind. v. 442; Brandis For. Flora 444; Gamble Man. Ind. Timb. 361. Vern. *Ráini*, *Dún*; *Kambel*, Jaunsar; *Rohni*, *Roini*, Garhwal.

Generally a small evergreen tree, but occasionally up to 50 ft. high and 5 ft. in girth; bark thin, dark-grey, somewhat rough; young branches rusty. *Leaves* alternate, simple, very variable both in size and shape, usually 3-9 in. long, ovate, ovate-oblong or lanceolate, entire or, if of luxuriant coppice-shoots, closely toothed, glabrous above, pubescent and with close-set red glands beneath, 3-nerved at the base; petiole about half the length of the blade, rusty-pubescent. *Inflorescence* and *flowers* brown or brick-red. *Calyx* 3-cleft. *Petals* and *disk* none. **MALE FLS.** clustered, anther-cells distinct and globose. **FEMALE FLS.** solitary. *Ovary* 3-celled; cells 1-ovuled; styles 3, papillose inside. *Fruit* a 3-lobed capsule, 3-5 in. diam., covered with a crimson powder when ripe; seeds about 1 in. diam., globose, smooth, black.

Extremely common in the *DÚN* and *SAHÁRANPUR* FORESTS and also up to 4,000 ft. in *JAUNSAAR* and *TEHRI-GARHWAL*.

Wood smooth, hard and close-grained; sapwood white; heart-wood light-red to darker red towards the centre in large stems; used chiefly as fuel. Annual rings indistinct; weight 48 lbs. per c. ft. The bark is sometimes used for tanning. The crimson powder, *kamelá*, which covers the ripe fruit, is used for dyeing silk, and also in medicine and Hindu religious ceremonies. The tree coppices exceedingly well.

Fl. Sept.-Nov. Fr. Mar.-May.

16. Macaranga, Thouars; G. P. n. 148.

1. **M. indica**, Wight; Fl. Br. Ind. v. 446; Gamble Man. Ind. Timb. 363. Vern. *Pápri*, *Málköt*; *Rámálo*, Kumaun.

A middle-sized tree with thick glaucous branches and grey smooth bark. *Leaves* alternate, 6-12 by 5-10 in., deltoid-ovate, peltate, acuminate, entire or very obscurely and distantly toothed, thinly coriaceous, glabrate and closely yellow-punctate beneath; base rounded or truncate with two glands above; lateral nerves about 10 pairs above the petiole, the basal pair penniveined; petiole 4-12 in. long,

glaucous; stipules .5 long, ovate, acuminate, recurved. *Flowers* dioecious, in axillary panicle racemes; bracts broad, concave. *Stamens* 6-8; anthers 4-celled. *Ovary* 1-celled. *Style* very short; stigma spurred. *Capsule* very small, covered with resinous points, crowned with the obliquely-placed spurred stigma; seeds globose.

Only found in the Malkôt Hills, DEHERA DÚN, 4,500 ft.: Sansarú and Láswáni Khálás.

Wood greyish-red, rather soft; pores large; medullary rays very fine, numerous; weight 33 lbs. per c. ft. Growth very fast.

Fl. Aug., Sept. Fr. Nov., Dec.

17. *Sapium*, P. Br.; G. P. n. 185.

Trees or shrubs. *Leaves* alternate, entire or toothed; petiole often with two glands at the top. *Flowers* in terminal racemes or spikes, monœcious, apetalous; MALES several in each bract; FEMALES at the base of the same racemes with male flowers, or in separate spikes, each in a bract. *Disk* none. *Calyx* 2-3-lobed or toothed or split to the base; sepals valvate. *Stamens* 2-3, filaments free; anther-cells distinct. *Ovary* 2-3-celled, with 1 ovule in each cell. *Styles* as many as the carpels, more or less connate at the base, undivided, spreading, stigmatose inside. *Fruit* a tardily dehiscent 3-valved capsule. *Seeds* globose; albumen fleshy.

Analysis of the Species.

- | | |
|---|--------------------------|
| Leaves rhomboid, entire; female flowers at the base of racemes of male flowers. | 1. <i>S. sebiferum</i> . |
| Leaves oblong-lanceolate, crenate; female flowers in separate spikes. | 2. <i>S. insigne</i> . |

1. ***S. sebiferum***, Roxb.; Fl. Br. Ind. v. 470. Syn.—*Excœcaria sebifera*, Muell. Arg.; Brandis For. Flora 441; Gamble Man. Ind. Timb. 366. The Chinese Tallow-tree. Vern. *Tár-charvi*, Dún; *Pahári Shisham*, Saháranpur.

A small gnarled tree. *Leaves* 2-3 in. long, rhomboid or broad-ovate, sometimes broader than long, acuminate, entire, membranous, glaucous beneath, somewhat resembling the leaflets of *Sissu*; petiole flexible, nearly as long as the blade, with 2 glands at the top. *Flowers* greenish-yellow monœcious, in terminal racemes 2-4 in.



long; FEMALE FLOWERS few, stoutly pedicelled, at the base of racemes bearing male flowers above, the male portion being caducous; MALE FLOWERS at the end of racemes of the above kind, or forming racemes entirely of their own which appear generally before the female or composite racemes. *Calyx* truncate. *Anthers* 2-3, large, exserted. *Ovary* glabrous; styles 3, connate at the base; stigmas recurved. *Capsules* sub-globose, glaucous, 4-5 in. diam. *Seeds* 3, enclosed in an arillus of a white fatty substance.

Growing wild everywhere in the Dún, but rather rare in the SAHÁRANPUR DIVISION. It is generally planted in avenues.

The wood is even-grained, light, soft or moderately hard; weight 32 lbs. per c. ft. The tallow of the seeds is separated by boiling in water, and is made into candles in China and Japan, where the tree is indigenous. The seeds give an oil, and the leaves a black dye.

Leafless Feb.-Apr. Fl. June-Aug. Fr. Oct.-Dec.

2 *S. insigne*, Benth.; Fl. Br. Ind. v. 471. Syn.—*Ex-cæcaria insignis*, Muell. Arg.; Brandis For. Flora 442; Gamble Man. Ind. Timb 367. Vern. *Khinná*, *Khindrá*, *Khinni*, *Khínni*, Dún and Garhwal.

A middle-sized deciduous tree with grey corky bark and thick milky juice. *Leaves* 6-12 in. long, elliptic or oblong-lanceolate, acuminate, crenate-serrate, soft, glabrous; lateral nerves slender, 12-20 pairs; petiole 1-2 in. long, with a pair of glands near the apex. *Flowers* in long fleshy terminal spikes; MALE in circular clusters subtended by two fleshy ovate acute green bracts; *calyx* membranous; lobes 2, rounded; *stamens* 2; FEMALE shortly pedicelled; *sepals* ovate; *stigmas* short. *Fruit* an ovoid capsule 3 in. long, numerous on a fleshy spike; seeds with an oily albumen.

Foot of the HIMALAYA and hot valleys up to 4,000 ft. Common at Tháno, Kálimatti, Ráipur, Sahansra-dhára, Saia, etc.

Wood white, very soft, spongy and very light, weighing about 25 lbs. per c. ft. It is used for cylinders of native drums. The milk is acrid and is said to be poisonous. It is often planted in hedges.

Leafless Dec.-Apr. Fl. Cold season. Fr. May, June.

Other plants of the Family that may be mentioned are:—

1 *Andrachne cordifolia*, Muell. Arg.; Fl. Br. Ind. v. 283. Vern. *Bharti*, *Bhartoi*, Jaunsar. A small shrub with slender branches. *Leaves* 1-2 in. long, ovate-oblong, obtuse, hairy beneath; petiole filiform, of various lengths. *Flowers* monœcious, on long filiform axillary pedicels. *Capsules* globose, 3 in. diam. Wood white and close-grained.



Baliospermum.]

71. URTICACEÆ.

JAUNSAK and TEHRI-GARHWAL, up to 8,000 ft. : Mundali, Konain, etc.
Fl. Rainy season.—G. P. n. 30.

2 *Ricinus communis*, Linn. ; Fl. Br. Ind. v. 457. The Castor-oil plant. Vern. *Erandi*, *Arandi*, Hind.—An evergreen shrub ; cultivated and run wild in villages. Leaves 1-2 ft. diam., palmately lobed, serrate, membranous, glaucous beneath, long-petiolate ; stem and petiole hollow. Flowers monœcious Stamens numerous. Ovary 3-celled ; styles spreading, feathery. Fruit a globose capsule, generally echinate, 1-1 in. long ; seeds oblong, mottled, with fleshy albumen. The Eri silk-worm is reared on its leaves. Besides the well-known oil, many parts of the plant are used in medicine.—G. P. n. 149.

3. *Baliospermum axillare*, Blume ; Fl. Br. Ind. v. 431. A stout undershrub, fairly common in shady places in the DUN : Lachiwala, Kalsi, etc. Leaves very variable, upper 2-3 in. long and lanceolate, lower 6-10 in. long, oblong or palmately lobed, 3-5-nerved at the base, rigidly coriaceous ; petiole stout, of various lengths. Flowers small, in interrupted racemes from the axils of the upper leaves. Capsule 3-5 in. long, 3-lobed. Fl. & fr. throughout the year.—G. P. n. 160.

ORDER 71. URTICACEÆ ; G. P. N. 153.

Herbs, shrubs, or trees, often with milky sap. Leaves usually alternate, simple, stipulate. Flowers generally 1-sexual, monœcious or diœcious, small, in heads, cymes or spikes or inside a hollow receptacle. Perianth simple, or of 3-5 free or connate segments. Stamens usually as many as perianth-segments and opposite to them, often inflexed in bud with reversed anthers. Ovary free, 1-celled, 1-ovuled ; style simple or 2-fid, often eccentric ; stigma armed or feathery. Fruit a samara drupe nut or achene, the last often in variously shaped receptacles.

This Family is divided into the following Tribes :—

I. ULMEÆ.—Flowers 2-sexual ; stamens not inflexed ; style 2-fid ; fruit a samara.—*Ulmus*, *Holoptelea*.

II. CRTLIDÆ.—Flowers polygamous ; stamens inflexed in bud ; style 2-fid ; fruit a drupe.—*Celtis*, *Trema*.



71. URTICACEÆ.

CSL

III. MOREÆ.—Flowers 1-sexual, in spikes or heads; stamens inflected; style generally 2-fid; fruit usually compound.—*Streblus*, *Plecosperrum*, *Morus*, *Broussonetia*.

IV. ARTOCARPEÆ.—Flowers 1-sexual, inside or around a fleshy receptacle; stamens not inflected; style simple; sap milky.—*Ficus*, *Cudrania*, *Artocarpus*.

V. URTICEÆ.—Flowers 1-sexual, usually in heads or clusters; stamens inflected; style simple; fruit a simple achene.—*Bæhmeria*, *Pouzolzia*, *Villebrunea*, *Debregeasia*, *Maoutia*, *Girardinia*.

Analysis of the Genera.

I. ULMEÆ.

- | | |
|--|------------------------|
| Leaves serrate; lateral nerves many, straight. | 1. <i>ULMUS</i> . |
| Leaves entire; lateral nerves few, arcuate | 2. <i>HOLOPTELEA</i> . |

II. CELTIDEÆ.

- | | |
|--|--------------------|
| Lvs. 3-nerved, smooth; male sepals imbricate | 3. <i>CELTIS</i> . |
| Lvs. 3-nerved, scabrous; male sepals valvate | 4. <i>TREMA</i> . |

III. MOREÆ.

Unarmed trees.

Flowers in spikes; fruit compound, fleshy. 7. *MORUS*.

Flowers fascicled or solitary; fruit a 1-seeded berry . . . 5. *STREBLUS*.

Armed shrubs; (flowers in heads; fruit a 1-2-seeded compound berry). . . 6. *PLECOSPERMUM*.

IV. ARTOCARPEÆ.

Leaves penni- or 3-nerved; fruit a hollow receptacle with free achenes inside. . . 8. *FICUS*.

Leaves penninerved; fruit a many-seeded compound berry . . . 9. *CUDRANIA*.

V. URTICEÆ.

Fruiting perianth dry or membranous.

Flower-heads in interrupted spikes. . . 10. *BÆHMERIA*.

Flower-heads in sessile axillary clusters . . . 11. *POUZOLZIA*.

Fruiting perianth fleshy.

Leaves broad; petiole slender, weak. . . 12. *VILLEBRUNEA*.

Leaves narrow; petiole stout, rigid. . . 13. *DEBREGEASIA*.

Fruiting perianth none; flower-heads cymose 14. *MAOUTIA*.

I. ULMEÆ.

1. *Ulmus*, Linn. ; G. P. n. 1.

1. **U. Wallichiana**, Planch. ; Fl. Br. Ind. v. 480; Brandis For. Flora 432; Gamble Man. Ind. Timb. 341. The Himayan Elm. Vern. *Emroi*, *Imroi*, Jaunsar.

A large deciduous tree with rough grey bark exfoliating in diamond-shaped scales ; young branches pubescent. *Leaves* alternate, 2-6 in. long, elliptic-ovate or obovate, long-acuminate, doubly serrate, scabrous or smooth above, pubescent beneath ; nerves 15-20 pairs, straight, each terminating in a large serrature, axils of nerves usually villous ; base unequal ; petiole 3-5 in. long ; stipules subulate, membranous. *Flowers* in dense lateral racemes, appearing before the leaves from the leaf-scars of last year's shoots ; pedicels 2 in., fascicled, jointed a little below the middle, pubescent below the joint. *Perianth* turbinate, glabrous, persistent ; lobes 5-6, ciliate. *Stamens* as many as the perianth-lobes, not inflected in bud. *Ovary* compressed, stipitate ; style 2-fid, inner side stigmatose to the base. *Fruit* a flat stipitate samara, 6-7 in. long, with an ovate or obovate membranous reticulate wing surrounding the seed.

JAUNSAK and TEHRI-GARHWAL, between 3,500 and 10,000 ft., generally in ravines, fairly common : Mohná Block, Konáin, Dh rá-gádh, Bálchá, Kúlni, etc.

Heartwood greyish-brown, fine-grained, moderately hard, with a very beautiful silver-grain, capable of a fine polish. The bark contains a strong fibre which is made into cordage, sandals and slow matches. The leaves are much prized as cattle-fodder, for which reason the tree is planted about villages.

New leaves Apr., May. Fl. Mar., Apr. Fr. May, June.

2. *Holoptelea*, Planch. ; G. P. n. 2.

1. **H. integrifolia**, Planch. ; Fl. Br. Ind. v. 481. Syn. — *Ulmus integrifolia*, Roxb. ; Brandis For. Flora 431; Gamble Man. Ind. Timb. 342. Vern. *Pápri*, *Káli Pápri*, *Banchillá*, Saháranpur.

A large deciduous tree ; bark grey or light-brown, with an offensive smell when fresh, marked with tubercles on branches. *Leaves* alternate, 3-6 by 2-3 in., elliptic or broad-oblong, acuminate, entire, coriaceous, glabrous or pubescent beneath ; nerves 5-8 pairs, arcuate ; base rounded or acute, rarely cordate or oblique ; petiole 2-3 in. long ; stipules ovate, membranous. *Inflorescence* as in *Ulmus Wallichiana* ; fascicles fewer-flowered. *Perianth* cleft to the base ; segments pubescent. *Stamens* 8 in male fls., 5 in 2-sexual fls. ; anthers hairy. *Ovary* long-stipitate. *Fruit* an oval or orbicular samara 1 in.



71. URTICACEÆ.

[*Holoptelea*.]

Long, generally chartaceous, cleft at the tip, often crowned with the remains of the style.

Common throughout the SAHÁRANPUR DIVISION; also found in a few places in the DÚN, and at low elevations in JAUNSAE, *e.g.*, Khairi swamp, Barkót, Tháno, Kálimatti, Kálsi, etc.

Wood yellowish-grey, moderately hard; pores small and uniformly distributed; heartwood and annual rings not distinct; weight 40 lbs. per c. ft. The wood is used for building, carts, and carving. The leaves, which have an unpleasant smell, are lopped for cattle-fodder. An oil can be extracted from the seeds.

Leafless Feb., Mar. Fl. while leafless. Fr. May-Aug., remaining long on the tree.

II. CELTIDÆ.

3. *Celtis*, Linn. ; G. P. n. 7.

1. *C. australis*, Linn.; Fl. Br. Ind. v. 482; Brandis For. Flora 428; Gamble Man. Ind. Timb. 343. Vern. *Kharik*, *Kharak*. Jaunsar and Garhwal; *Kharak-cheni*, Dún.

A middle-sized deciduous tree; bark bluish-grey or brown, often with whitish specks, larger trees with narrow horizontal wrinkles; branchlets drooping. *Leaves* alternate, 3-5 in. long, obliquely ovate or ovate-lanceolate, long-acuminate, entire towards the base, coriaceous and tough when full-grown, dark green and glabrous above, with 3 strong basal nerves, midrib penniveined; base acute or rounded, sometimes oblique; petiole 3-5 in. long; stipules subulate, caducous. *Flowers* polygamous, 4-5-merous, male and 2-sexual on short capillary pedicels at the base of the shoots; female long-pedicelled and axillary. *Sepals* 4-5, oblong, imbricate, deciduous, with woolly margins. *Stamens* 4-5, short. *Ovary* sessile, woolly. *Fruit* an ovoid drupe, 3 in. long, more or less reticulately rugose; peduncle 5-2 in. long.

Fairly common between 4,000 and 8,500 ft. in JAUNSAE and TEHRI-GARHWAL, especially about villages where it is planted for shade and fodder; very numerous at Bámsu and Kúlni. Also in many places in the DÚN, both planted and self-grown, *e.g.*, Nakraunda, Haráwála, Mothronwála, Karwápáni, etc.

Wood yellowish-grey with irregular streaks of darker colour; annual rings distinct; weight 47 lbs. per c. ft. It is tough and strong, and is used for oars, whip-handles, churn-sticks and other purposes. The leaves are lopped for fodder.

New leaves and fl. Mar.-May. Fr. June-Sept.

4. *Trema*, Lour. ; G. P. n. 9.

Shrubs or trees. *Leaves* alternate, generally 3-nerved ; stipules caducous. *Flowers* very small, monœcious, in axillary cymes. *Sepals* 4-5, induplicate valvate in the male fls., subimbricate in the female. *Stamens* 5, longer than the sepals. *Ovary* sessile ; style 2-fid, arms linear. *Fruit* a small drupe, supported by the persistent perianth and crowned by the arms of the style.

Analysis of the Species.

- Leaves broad, soft, tomentose beneath . 1. *T. orientalis*.
Leaves narrow, hard, rough on both sides 2. *T. politoria*.

1. **T. orientalis**, Blume ; Fl. Br. Ind. v. 484. Syn.—*Sponia orientalis*, Planch. ; Brandis For. Flora 430 ; Gamble Man. Ind. Timb. 344. The Charcoal Tree. Vern. *Jiban*, Bengal.

A small rapidly-growing and short-lived tree ; bark thin, greyish or bluish-green, smooth, with numerous lenticels. *Leaves* 3-6 by 2-3.5 in., ovate or ovate-oblong, acuminate, crenate-serrulate, membranous, scabrid above, soft-tomentose beneath ; base 3-7-nerved, cordate, lateral nerves 3-4 pairs above the basal ; petiole .3-4 in. *Cymes* lax, spreading. *Drupe* .15 in. long, ovoid, black when ripe.

Gularghâti, Nakraunda and other swampy places in the DÚN ; fairly common, but is apt to be mistaken for *Grewia lavigata*.

Wood light-reddish-grey, light and soft ; weight 28 lbs. per c. ft. The bark gives a strong fibre, and the leaves are lopped for fodder.

Fl. Feb.-Apr. Fr. June-Aug.

2. **T. politoria**, Planch. ; Fl. Br. Ind. v. 484. Syn.—*Sponia politoria*, Planch. ; Brandis For. Flora 430 ; Gamble Man. Ind. Timb. 345. Vern. *Khágshí*, *Khákshí*, *Kúri*, Dún ; *Khardál*, Saháranpur.

A shrub or small tree with smooth bark and scabrid branches. *Leaves* 2-5 by 3-2 in., oblong or ovate-lanceolate, acuminate, serrulate, suberaceous, very hard and scabrid on both surfaces, dark-green and shining above, paler beneath, trinerved at the base, lateral nerves 7-8 pairs, arcuate, depressed above ; base nearly equal, rounded or cordate ; petiole 2-4 in. *Cymes* compact, generally not exceeding the petiole. *Drupe* 1-1.5 in. diam., globose.

Common in the DÚN and SAHÁRANPUR DIVISIONS, along Ráu and river banks and in abandoned fields. Comes up freely on landslips as in the SAHÁRANPUR SIWALIKS, where it is very valuable for binding the soil.



Wood white, moderately hard. Growth very fast, only 2 rings per inch of radius. Weight 36 lbs. per c. ft. The bark gives a strong fibre used for making ropes. The leaves are lopped for fodder and are used like sandpaper to polish wood and horn.

New leaves Mar., Apr. Fl. Apr.-June. Fr. Oct., Nov.

5. *Streblus*, Lour.; G. P. n. 21.

1. *S. asper*, Lour.; Fl. Br. Ind. v. 489; Brandis For. Flora 410; Gamble Man. Ind. Timb. 326. Vern. *Dakid*, *Kurchná*, *Saháranpur*.

A small evergreen tree with milky juice; bark light-grey, irregularly ribbed. *Leaves* alternate, 2-4 in. long, elliptic, rhomboid or obovate, irregularly toothed, acute or obtuse, coriaceous, scabrid with minute raised dots; base cuneate; petiole .08-1 in. long, pubescent; stipules lanceolate. *Flowers* generally dioecious. MALE FL. in short-peduncled heads or spikes; *sepals* 4, imbricate; *stamens* 4, inflexed in bud; *heads* sometimes androgynous. FEMALE FL. pedunculate, solitary or a few together in the axils of leaves; peduncle slender, .6-8 in. long; *sepals* 4, concave, embracing the ovary, enlarged in fruit; *style* central bifid, with long spreading arms. *Fruit* a 1-seeded globose berry, .2 in. long, yellow when ripe.

Common in the SAHÁRANPUR DISTRICT, especially towards the Jumná; often planted in hedgerows: Roshanpur, Shúfipur, Kásimpur, Bánipur, etc.

Wood white, moderately hard, tough and elastic; weight 40 lbs. per c. ft.; no heartwood. It is much sought after in Bengal for making yokes. The twigs are used as tooth brushes, and the rough leaves to polish wood and ivory. The milky juice is medicinal. The fruit is eaten when ripe.

New leaves Mar. Fl. Jan.-Mar. Fr. May-July.

6. *Plecosperrum*, Trecul; G. P. n. 26.

1. *P. spinosum*, Trecul; Fl. Br. Ind. v. 491; Brandis For. Flora 401; Gamble Man. Ind. Timb. 327.

A large thorny shrub, closely resembling *Cudrania javanensis* in habit and foliage; spines axillary, straight, stout; bark light-brown or orange. *Leaves* alternate, 2-3 in. long, elliptic-oblong or obovate, obtuse or acute, quite entire, glabrous, penniveined; petiole .3-5 in. long. *Flowers* dioecious, in axillary pedunculate heads; heads solitary or 2-3 together. MALE HEADS .2-3 in. diam.; *sepals* 4, obtuse, imbricate, hairy outside, emarginate and ciliate at the tips; *stamens* 4, inflexed in bud, afterwards exserted. FEMALE HEADS smaller than male heads in flower, afterwards .5 in. diam., pubescent; *perianth* gamophyllous, with a 4-toothed mouth, connate into a globose head;



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style simple, filiform, much exserted, hairy; stigma papillose. *Fruit* a 1-2-seeded irregularly shaped berry, 5 in. diam., rather smooth, velvety outside.

Believed to occur in the DŪN, but has not yet (Oct. 1901) been satisfactorily identified.

Sapwood white; heartwood small, bright-orange, very hard, with a yellow resin; weight 50 lbs. per c. ft. A yellow dye is extracted from the wood in the Darjeeling Terai.

Fl. Feb.-Apr.

III. MOREÆ.

7. *Morus*, Linn.; G. P. n. 33.

Trees or shrubs. *Leaves* alternate, simple; base 3-nerved; stipules small, caducous. *Flowers* unisexual, in spikes. MALE FL.: *Sepals* 4, imbricate. *Stamens* 4, inflexed in bud, opposite to and longer than the sepals. *Pistillode* small. FEMALE. FL.: *Sepals* 4, imbricate, accrescent and succulent in fruit. *Ovary* 1-celled, straight; style central, 2-fid. *Fruit* a compound berry, the perianths coalescing to form a gelatinous pericarp.

Analysis of the Species.

- | | |
|---|------------------------|
| Leaves shortly acuminate, glabrate; fruit whitish | 1. <i>M. alba</i> . |
| Leaves short-tailed, soft-tomentose; fruit purple | 2. <i>M. serrata</i> . |
| Leaves long-tailed, rough; fruit black | 3. <i>M. indica</i> . |
1. *M. alba*, Linn.; Fl. Br. Ind. v. 492; Brandis For. Flora 407; Gamble Man. Ind. Timb. 327. Vern. *Tūttri*, *Tūntri*, Dūn; *Tūt*, *Tūnt*, Hind.

A middle-sized deciduous tree with pubescent shoots. *Leaves* 2-3 in. long, ovate to lanceolate, acute or acuminate, dentate or serrate, sometimes lobed, membranous, glabrous above, slightly pubescent along the midrib and nerves beneath; base 3-nerved, rounded or truncate, sometimes cordate; petiole 5-13 in. long, slender. *Flowers* monœcious, sometimes cordate; peduncle 5-7 in. long, slender. *Fruit* 3-5 in. long, white or tinged with pink; peduncle 5-7 in. long, slender.

Cultivated or run wild in the DŪN. Planted in avenues along the Dehra—Rāmpur-Mandi Road.

The wood is fine and close-grained, and is used for building boats, furniture and agricultural implements; weight 36-56 lbs. per c. ft. Silk-worms are fed on its leaves, and the fruit is eaten, that of some varieties being excellent.

New leaves and fl. Mar., Apr. Fr. May, June, or later.



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[*Morus*.]

2. *M. serrata*, Roxb. ; Fl. Br. Ind. v. 492 ; Brandis For. Flora 409 ; Gamble Man. Ind. Timb. 328. Vern. *Kimú*, Jaunsar ; *Himú*, also *Tút* or *Túnt*, Dún.

A large deciduous tree with scaly buds ; bark reddish- or greyish-brown, generally smooth and lenticellate on branches, exfoliating on old stems ; young shoots pubescent. *Leaves* 2-8 by 1·5-6 in., broad-ovate, generally cordate, toothed or serrate (sometimes doubly), often 3-lobed, shortly caudate-acuminate, membranous, slightly pubescent or glabrous above, thickly grey-tomentose beneath, 3-nerved at the base ; petiole 1-1·7 in., tomentose. *Flowers* diœcious. *Male spikes* 1-2 in. *Female spikes* 5-7 in. long ; styles very hairy. *Fruit* 7-1 in. long, mucilaginous, purple ; peduncle 1-2 in. long, stout, hairy.

Cultivated and wild in JAUNSAAR and TEHRI-GARHWAL, 4,900 ft. ; also in the DÚN, e.g., at Kálúwála. Common at Mussoorie.

Sapwood small, white ; heartwood yellow or brown, moderately hard, fine-grained ; weight about 35 lbs. per c. ft. It works and seasons well, and takes a fine polish. It is used for cabinet-work and agricultural implements. The leaves are used as cattle-fodder. The fruit is sweet, and is eaten.

New leaves and fl. in Apr., May. Fr. June-Aug.

3. *M. indica*, Linn. ; Fl. Br. Ind. v. 492 ; Brandis For. Flora 408 ; Gamble Man. Ind. Timb. 328. Vern. *Siá Tút* or *Siá Túnt*, Hind.

A moderate-sized deciduous tree with reddish- or yellowish-brown smooth bark marked with long horizontal lenticels. *Leaves* 2-5 by 1-3 in., ovate, caudate-acuminate, sharply serrate, often lobed, membranous, pubescent when young, scabrous when mature, 3-nerved at the base ; petiole 5 to 1·5 in. long, sparsely hairy. *Flowers* monoœcious. *Female spikes* 3-5 in. long, ovoid ; styles long, hairy. *Fruit* small, black when ripe ; peduncle 1-2 in. long, very slender.

Some botanists consider this a form of *M. alba*.

Not uncommon in the DÚN and SAHÁBANPUR DISTRICTS and also in the PUNJAB (Sháhderá and Changá Mangá).

Wood yellow when fresh-cut, turning brown and mottled afterwards, rather hard ; weight about 45 lbs. per c. ft. ; growth very fast in favourable localities. Often cultivated for its leaves, which are used to feed silkworms.

New leaves and fl., Feb., Mar. Fr. May.

Broussonetia papyrifera, Vent. ; Fl. Br. Ind. v. 490 ; the Paper Mulberry, — was first introduced in the Kauli garden at DEHRA, whence it has spread, and is now found self-grown in many places. *Leaves* 5-9 in. long, obliquely ovate, acuminate, often lobed, membra-

nous, tomentose; petiole 2-4 in. long. *Flowers* in heads. Wood very soft and light. The bark gives a fine fibre which is made into paper in Japan. —G. P. n. 24.

IV. ARTOCARPEÆ.

8. *Ficus*, Linn.; G. P. n. 39.

The Figs.

Trees or shrubs with milky sap. *Leaves* alternate (opposite in *F. hispida* and *sæmocarpa*), entire toothed or lobed; stipules deciduous. *Flowers* minute, unisexual, on the inner surface of a fleshy hollow receptacle which has an aperture at the apex partly closed by imbricate bracts, often mixed with bracteoles. MALE FL.: *Perianth* thin, 2-6-partite, imbricate. *Stamens* 1-2; anthers of 2 distinct cells. FEMALE FL.: *Perianth* as in the male, or none. *Style* eccentric; ovule pendulous. *Achenes* crustaceous or fleshy. *Receptacles* bracteate, 1-sexual or androgynous, with the male flowers near the mouth.

NOTE.—Besides the male and female, two other kinds,—gall and neuter flowers,—are sometimes found in the receptacles. The gall flowers are females with shorter styles and with the ovary occupied by the pupa of a Hymenopterous insect (Gall-insect). The neuter flowers, which only occur in one or two species not found in India proper, have the perianth of the males, but no stamens. In the same receptacle there may be males and females, or males, females and galls, or males and galls, or females and neuters, or only females.

Analysis of the Species.

- A. Epiphytic in early life; recepts axillary, in pairs, sessile except in 1 and 3.
- a. Petiole not jointed to the blade, and less than $\frac{1}{2}$ its length.
 - Lvs. thickly coriaceous, scarcely twice as long as broad.
 - Lvs. large; nerves distinct, reticulate . . . 1. *F. bengalensis*.
 - Lvs. small; nerves faint, parallel . . . 4. *F. retusa*.
 - Lvs. thinly coriaceous, often up to three times as long as broad.
 - Lvs. and branchlets scaberulous; stipules as long as the petiole . . . 1. *F. gibbosa*.
 - Lvs. and branchlets smooth; stipules scarcely $\frac{1}{2}$ the length of the petiole. . . 3. *F. glaberrima*.

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A. Petiole jointed to the blade, and usually equal to at least half its length.

Leaves broad, caudate acuminate; ripe fruit black.

Acumen short; petiole channelled or flattened above

5. *F. Rumphii*.

Acumen long; petiole quite terete

6. *F. religiosa*.

Leaves narrow, abruptly acuminate; ripe fruit white

7. *F. insectoria*.

B. Not epiphytic in early life; recepts. axillary, solitary except in 16, peduncled.

Erect shrubs or small trees.

Leaves narrow, abruptly long-acuminate, hard, distantly toothed

9. *F. clavata*.

Leaves narrow, gradually acuminate, soft, quite entire

16. *F. nemoralis*.

Leaves broad, acute, closely dentate or crenate

15. *F. palmata*.

Scandent or prostrate shrubs.

Leaves and fruit very rough

8. *F. heterophylla*.

Leaves and fruit more or less smooth.

Leaves subacute, coriaceous; receptacles small

13. *F. scandens*.

Leaves long-acuminate, membranous; receptacles large

14. *F. foveolata*.

C. Never epiphytic; receptacles generally on leafless racemose branches (axillary on young plants of 10 and 11).

Leaves opposite.

A small tree; leaves broad

10. *F. hispida*.

A small prostrate shrub; leaves narrow

11. *F. samocarpa*.

Leaves alternate.

Leaves unequal-sided; petiole very short

12. *F. Cunia*.

Leaves symmetrical; petiole usually long.

A small tree; leaves large, hard, subcoriaceous

17. *F. Roxburghii*.

A large tree; leaves small, soft, membranous

18. *F. glomerata*.

1. *F. gibbosa*, Bl.; Fl. Br. Ind. v. 496; King Fic. 4, t. 2.

Syn. — *F. parasitica*, Koenig; Brandis For. Flora 420. Vern. *Chhānchri*, Dún and Garhwal; *Dádu Bándá*, Dún.

A much-branched small evergreen tree, epiphytic in early life; bark thin, brownish-grey. Leaves alternate, 2.5-4.5 by 1-2 in., elliptic-oblong, acute at both ends, entire, subcoriaceous, generally smooth above, always more or less scaberrulous beneath, somewhat oblique and 3-nerved at the base; lateral nerves 4-6 pairs, prominent beneath,

areolate, joining within the margins; petiole 2-4 in. long; stipules ovate-lanceolate, convolute, generally as long as the petiole. MALE FL.: sepals 4-6, linear, fleshy, hairy; stamen 1; pistil abortive. GALL FL.: sepals of the male; style short. FEM. FLS. in separate receptacles; sepals 4, hyaline; style elongate. Receptacles 2-3 in. across, solitary or in pairs, pyriform-globose, scabrid and mammillate, yellow when ripe; basal bracts 0; peduncle 2-3 in. long, bracteate at the base.

Very common in the DÚN as an epiphyte generally on large old trees, notably Pípal and Haldú: Káluwála, Lachiwála, Dúdhli, Phándowála, etc. Occasionally in the SAHÁRANPUR DIVISION.

The leaves are very good for cattle-fodder, and are said to increase the flow of milk in milch cows.

Fr. ripens Jan.-Mar.

Two varieties of this species occur in the SCHOOL CIRCLE.

1. Var. *parasitica*, sp. Koenig. Leaves broad, nearly rhomboid, more or less scabrid on both surfaces.

2. Var. *tuberculata*, sp. Roxb. Leaves narrower and smaller, generally smooth above, sometimes (but not in the DÚN specimens) irregularly serrate.

2. **F. bengalensis**, Linn.; Fl. Br. Ind. v. 499; King Fic. 18, t. 13.; Brandis For. Flora 412; Gamble Man. Ind. Timb. 333. The Banyan tree. Vern. Bar, Bargat, Hind.

A large evergreen tree throwing down numerous aerial roots from the branches which are mostly horizontal; bark greyish-white, smooth, exfoliating in irregular flakes; young parts softly pubescent. Leaves alternate, 4-8 by 2-5 in., ovate or elliptic, entire, obtuse, subcordate or rounded at the base, thickly coriaceous, glabrescent above, with 3-7 basal nerves and 4-6 pairs of main lateral nerves; petiole 1-2 in. long, stout; stipules 7-1 in. long, coriaceous, sheathing. MALE FL. crowded near the mouth of the receptacle; sepals 4; stamen 1. FEMALE FL. with a shorter perianth; style long; male and female in the same receptacle. Fruit 5 in. diam., in axillary pairs, sessile, globose, puberulous, red when ripe, supported on 3 broad coriaceous basal bracts.

Fairly common in the Sál forests of the DÚN and along the foot of the SIWALIKS in the SAHÁRANPUR DIVISION. Much planted in villages and in avenues throughout India. Assisted by the aerial roots which serve as supports for the branches and also as feeders, the crown spreads enormously when the tree grows out in the open. Trees with crowns 200 to 300 ft. in diam. are not uncommon, while the girth often attains 25 to 30 ft., and the height 80 to 90 ft.

Wood grey, moderately hard, appearing as made up of thin plates on a cross section; no heartwood; weight about 40 lbs. per c. ft. It is durable under water, and is therefore used for well-curbs



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[Ficus.]

The wood of the drops is tough and elastic, and is used for tent-poles, cart-yokes and carrying-poles. The milky juice is made into bird-lime. The leaves and twigs are a favourite fodder for cattle and elephants; the former are also used as plates. Lac is sometimes collected on the tree. The fruit is eaten in times of scarcity and is greedily devoured by birds and monkeys. The tree is easily propagated by cuttings. It is, however, a nuisance in forests where it takes too much space, and its dense shade makes it impossible for any other trees to grow under it. In the DŪN forests the Haldú seems to be the most favourite host for the epiphytic Banyan.

New leaves Mar., Apr. Fr. ripens Apr., May.

Allied to this is the India-rubber tree, *F. elastica*, Roxb.; FL. Br. Ind. v. 508; King Fic. 45, t. 54;—a native of Assam and Burma, successfully cultivated in DEHRA and SAHÁWANPUR. It is a handsome evergreen tree, exceedingly suitable for avenues. *Leaves* dark-green, glossy; lateral nerves numerous, straight and parallel; stipules long, lanceolate, coloured and amplexicaul. *Recept* 5 in. long, ovate-oblong.

3. *F. glaberrima*, Blume; FL. Br. Ind. v. 506; King Fic. 37, t. 43. Vern. *Kákhri*, *Khámkri*, *Durlá*, Hind.

A tall tree, epiphytic in early life; bark thin, dark-grey, smooth. *Leaves* alternate, 4-6 by 1.5-2 in., oblong ovate-lanceolate or elliptic, shortly blunt-acuminate, entire, sub-coriaceous, glabrous and shining above, minutely pubescent or glabrescent beneath; main lateral nerves 8-10 pairs, rather horizontal, arcuate, joining within the margins; base subacute or slightly rounded, 3-nerved; petiole 5-1.2 in. long; stipules linear-lanceolate, 4-7.5 in. long., glabrous. MALE FL. few, near the mouth of the receptacle; *sepals* 4, lanceolate; *stamen* 1, filament short. GALL FL.: *perianth* 4-cleft. FEM. FL.: *perianth* 0. *Receptacles* 2-3 in. across, in axillary pairs, globose, slightly verrucose when young, smooth and orange-coloured when ripe; peduncle about half the length of the subtending petiole; basal bracts 3, broad, minute, deciduous.

Swampy localities in the DŪN, e.g., Nakraunda and Mothron-wála, and along streams in shady ravines at low elevations in the HILLS, e.g., Tons bank near Kálsi. Also in the Sansáru Khálá, MÁLKŌT.

The leaves and tender young shoots are lopped for fodder.

Fr. ripens Feb., Mar.

4. *F. retusa*, Linn. var. *nitida*, Thunb.; FL. Br. Ind. v. 511; King Fic. 50, t. 62; Brandis For. Flora 417; Gamble Man. Ind. Timb. 336. Of all the Figs described in this book it resembles *F. elastica* most closely, from which, however, it differs in having smaller leaves and subglobose receptacles. The flowers also are different.



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A large evergreen tree; bark dark-grey, smooth, with transverse lines of lenticel bars. Leaves alternate, 2-4 by 1·3-2·5 in., ovate elliptic or rhomboid, acute or short-acuminate, entire, coriaceous glabrous and shining; lateral nerves numerous, slender; base 3-nerved narrowed into the petiole which is 3-5 in. long; stipules lanceolate about 5 in. long. MALE FL. numerous; *sepals* 3, oblanceolate; *stamen* 1. GALL FL. *sepals* 3, spatulate. FEM. FL. perianth very small; ovary smooth, style short. *Receptacle* about 2 in. diam., in axillary pairs, sessile, subglobose, yellowish when ripe; basal bract broad-ovate, persistent.

Only a few indigenous looking trees in the Buláwá Pass in the SIWALIKS behind the crest; elevation 3,000 ft. Cultivated at DEHEA DÚN and SAHÁRANPUR.

Wood light reddish-grey, moderately hard, very prettily mottled, but used chiefly for fuel; weight about 40 lbs. per c. ft. The leaves are used for elephant-fodder. Evergreen and umbrageous, it makes an excellent avenue tree.

Fr. Feb., Apr.

5. **F. Rumphii**, Blume; Fl. Br. Ind. v. 512; King Fic. 54, t. 67B. Syn.—*F. cordifolia*, Roxb.; Brandis For. Flora 416; Gamble Man. Ind. Timb. 335. Vern. *Pilkhan*, *Khabar*, Hind.; *Pilkhoi*, Jaunsar.

A large deciduous tree; bark yellowish-grey, smooth, on older stems exfoliating in hard scurfy scales. Leaves alternate, 4-6 in. long, broad-ovate or ovate-oblong, acuminate, quite glabrous, shining above; acumen never exceeding an inch, often quite short; margins entire, undulate; lateral nerves 3-6 pairs; base shallow-cordate truncate rounded or narrowed towards the petiole, 3-5-nerved; petiole 2-3·5 in., channelled or flattened above, jointed to the blade. MALE FL. few near the mouth of the receptacle; *sepals* 3; *stamen* 1. FEMALE and GALL FLS.: *sepals* 3, lanceolate; ovary ovoid, smooth; style elongate. *Achenes* mucilaginous. *Receptacles* 5 in. across, globose, sessile, in axillary pairs, black when ripe; basal bracts 3, orbicular.

Common in the DÚN and SAHÁRANPUR FORESTS, and also in the Tons and Jumná valleys in JAUNSAAR and TEHRI-GARHWAL.

Wood very soft, spongy, pinkish-white, mottled on a radial section; weight 27 lbs. per c. ft. Lac insects are reared on it in Assam. The leaves and branches are lopped for cattle and elephant fodder, and the fruit is eaten. Often planted in avenues, but is a destructive epiphyte in forests.

New leaves in Mar. Fr. ripens May, June.

Somewhat similar in appearance, though much smaller in size, is *F. Arnottiana*, Miq.; Fl. Br. Ind. v. 513; King Fic. 56, t. 68,—



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GL.
Ficus.

found by Mr. Gamble at Thadiar in TEHRI-GARHWAL. It is usually epiphytic, but is found more generally on rocks. *Leaves* resembling those of *F. Rumphii*, but the base is never narrowed to the petiole, and the stipules are larger. *Perianth* gamophyllous. *Receptacles* smaller, generally peduncled; basal bracts brown, membranous.

6. *F. religiosa*, Linn.; Fl. Br. Ind. v. 513; King Fic. 55, t. 67A. Brandis For. Flora 415; Gamble Man. Ind. Timb. 334. Vern. *Pīpal*, *Pipli*, Hind.

A large deciduous tree; bark grey, with brownish specks, smooth, exfoliating in irregular flakes; trunk irregularly shaped. *Leaves* alternate, 4.5-7 by 3-5 in., orbicular-ovate, thinly coriaceous but tough, shining above, reddish when young, white-tubercled when mature; acumen 1-3 in. long; margins entire, undulate; main lateral nerves 6-8 pairs, joined by prominent closely reticulate veins; base shallow-cordate rounded or truncate, sometimes abruptly narrowed into the petiole, 5-7-nerved; petiole 3-4 in. long, terete, slender, nodding, jointed to the blade; stipules minute. MALE FL. very few, often absent, sessile; *sepals* 3; *stamen* 1, filament short. GALL and FEMALE FLS.: *sepals* 5; *style* short, lateral. *Receptacles* .5 in. across, sessile, in axillary pairs, sub-globose or somewhat depressed, dark purple when ripe; basal bracts 3, rounded, coriaceous, pubescent.

A well-known and common tree throughout India, both in forests and about habitations, much planted by Hindus, especially near temples and wells, often up to as high as 5,000 ft. in the OUTER HIMALAYA. It is held in so much veneration by the Hindus that killing a *Pīpal* tree is looked upon as a great sin, second only to that of killing a *Brāhman*.

Wood greyish-white, moderately hard, not so mottled as of the preceding species; weight 30-40 lbs. per c. ft. It is made into charcoal and used for packing cases. The leaves and branches are good for elephant-fodder. The milky juice hardens into a substance resembling guttapercha. It is a fast-growing tree and very suitable for avenues, for which purpose it can be propagated by cuttings. It is, however, an epiphyte destructive to forest trees, and often does great damage to buildings and walls on which it grows by sending down roots through their crevices.

New leaves Feb.-Apr. Fr. ripens Apr.. May.

7. *F. infectoria*, Roxb.; Fl. Br. Ind. v. 515; King Fic. 60, t. 75-79; Brandis For. Flora 414; Gamble Man. Ind. Timb. 335. Vern. *Khabar*, Hind.; *Dūthli*, *Pilkhōi*, Jaunsar; *Pākhar*, Dūn; *Kobrā*, *Pilkharn*, Garhwal. This tree is often mistaken for *F. Rumphii* and for *F. glaberrima*; consequently the same vernacular names are usually applied to all three of them.

A large tree with greenish-grey smooth bark, sometimes sending down a few aerial roots. *Leaves* alternate, 3-6 in. long, oblong-ovate or ovate, abruptly acuminate, glabrous and shining, rather membranous; margins entire, undulate; lateral nerves 6-8 pairs; base acute, rounded or cordate, 3-nerved; petiole 1.5-2 in. long, channelled. MALE FL. few, sessile; *sepals* 4; *stamen* 1, anther broad-ovate. FEMALE and GALL FLS.: *sepals* 3 or 4; *stigma* elongate. *Receptacles* .25 in. diam., sessile, globose, in axillary pairs, tubercled white when ripe; basal bracts 3, ovate, minute.

Not uncommon in the DŪN, but abundant in the Pathri forest and elsewhere in the SAHĀRANPUR DISTRICT, often as an epiphyte on other trees in early life; also found in the TONS VALLEY near Thadiār.

Wood grey, moderately hard, but not durable; weight 35 lbs. per c. ft. Medullary rays prominent on a radial section. The young shoots are eaten in curries; the leaves are a good elephant-fodder. The bark gives a fibre which can be used for rope.

Two varieties of this species occur in the SCHOOL CIRCLE;—

1. The type; *leaves* rather narrow; petiole hardly exceeding 1.5 in.; *receptacles* sessile;—more common in the HILLS.

2. Var. *Lambertiana*, sp. Miq. *Leaves* broader, generally cordate or rounded at the base; petiole up to and even exceeding 2 in.; *receptacles* shortly peduncled, somewhat larger, sometimes white-felted;—found along the foot of the SIWALIKS, and also in the plains beyond.

New leaves Feb.-Apr. Fr. ripens May, June, but remains long on the tree.

8. ***F. heterophylla***, Linn.; Fl. Br. Ind. v. 518; King Fig. 75, t. 94; Brandis For. Flora 424.

A straggling shrub. *Leaves* alternate, 2-6 in. long, very variable, from narrow-lanceolate to broad-ovate, entire or lobed, toothed or repand, scabrid, acuminate; petiole .5-2 in. long; stipules .5 in. long, ovate. *Receptacles* .5-1 in. long, globose or pyriform, solitary, yellow and smooth when ripe, scabrid when young, mouth partially open; peduncle .5-1 in. long; basal bracts minute.

Generally on banks of rivers and moist localities; e.g., Robbers' Cave, Tapkeswar and such other places in the DŪN; rather rare.

9. ***F. clavata***, Wall.; Fl. Br. Ind. v. 520; King Fig. 87, t. 111. Syn.—*F. trachycarpa*, Miq.; Brandis For. Flora 421. Vern. *Khānoi*, Jaisar; *Sāysoi*, Kālsi.

A shrub or small tree with rough branchlets. *Leaves* alternate, 4-8 in. long, oblong-lanceolate, long-acuminate, distantly toothed, hard and rough; main lateral nerves 6-8 pairs, arcuate; petiole 1-2



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in. *Receptacles* axillary, solitary, globose, ellipsoid or obovoid, 5-8 in. long, with a rough uneven surface, yellow when ripe; peduncle 1-2 in. long; basal bracts minute.

Shady valleys in the OUTER HIMALAYA and also in JAUNSEAR and TEHRI-GARHWAL: Kálsi, Thadiár, etc.

Fr. ripens in May and June.

10. **F. hispida**, Linn.; Fl. Br. Ind. v. 522; King Fic. 116, t. 154; Brandis For. Flora 423; Gamble Man. Ind. Timb. 340. Vern. *Káksá*, *Ghogshá*, *Gobhá*, Dún; *Goblá*, Hind.

A moderate-sized tree with hollow branches; bark thin, grey or greenish, warty on old stems, otherwise smooth, often with transverse wringles. *Leaves* opposite, 4-12 in. long, ovate or obovate-oblong, acute or shortly acuminate, serrate or dentate, rarely entire, coriaceous, scabrid above, tomentose beneath; lateral nerves 4-6 pairs, the lowest pair from the base; base rounded or subcordate, rarely cuneate; petiole 5-4 in. long, hispid; stipules 5 in. long, pubescent. *MALE FLS.*: *sepals* 3, broad. *GALL* and *FEMALE FLS.*: *perianth* tubular and short or none; *style* short, lateral. *Achene* rhomboid. *Receptacles* obovate, 1 in. long, pale-green and faintly ribbed when ripe, hispid, usually clustered on leafless, often drooping branchlets from the trunk or old wood, less frequently (generally on very young plants and shoots) in axillary pairs; peduncle 2-5 in. long; basal bracts 3, small, persistent.

Fairly common in the DÚN and SAHÁRANPUR DIVISIONS, generally in shady places.

Wood dirty-grey, coarse-grained, soft, no heartwood, no annual rings; weight about 30 lbs. per c. ft. The leaves are lopped for cattle-fodder. The young fruit is made into curries. The bark of young shoots gives a strong fibre which is good for rope.

New leaves Feb., Mar. Fr. generally throughout the year.

11. **F. sœmocarpa**, Miq.; Fl. Br. Ind. v. 523; King Fic. 115, t. 152. Syn.—*F. tuberculata*, Wall.; Brandis For. Flora 424.

A low spreading shrub; young shoots, petioles and nerves rusty-hirsute. *Leaves* opposite, crowded at the ends of the branches, 3-9 by 7-15 in., narrowly oblanceolate, less frequently lanceolate, acuminate, generally entire, often more or less scabrid; main lateral nerves 6-8 pairs, very arcuate; base 3-nerved, gradually narrowed to the petiole; petiole 3-9 in. long; stipules persistent, scarious, about as long as the petiole. *Male fls.* with 3-4 sepals and 1 stamen. *Gall* and *Fem. fls.* without any perianth. *Receptacles* 5-1 in. across, axillary and solitary on young plants, in short axillary panicles on old stems, pyriform-globose, verrucose, longitudinally 8-10-ribbed; peduncle 3-6 in. long, pubescent; basal bracts 3, triangular, deciduous.



Robbers' Cave in the DÚN; trailing on rocks near streams. Somewhat rare.

Fr. ripens Dec.-Feb.

12. **F. Cunia**, Ham.; Fl. Br. Ind. v. 523; King Fic. 101, t. 126; Brandis For. Flora 421; Gamble Man. Ind. Timb. 339. Vern. *Khain*, *Kheindá*, Dún; *Jarkphali*, Hind.

A moderate-sized tree with dark-grey bark. *Leaves* alternate, 6-10 in. long, oblong-lanceolate, very unequal-sided, acuminate, serrate, rarely entire, scabrid on both surfaces or glabrate above and pubescent beneath, coriaceous; lateral nerves 8-12 pairs; base semicordate or semisagittate with a large round 3-nerved lobe on one side; petiole 2-6 in. long, scabrid; stipules 7-1 in. long, linear lanceolate. *Male sepals* 3. *Female and Gall sepals* 4, united below; *style* lateral. *Achene* ovoid, mucilaginous. *Receptacles* globose or pyriform, 5-7 in. diam., reddish-brown and ribbed when ripe, hispid, on leafless paniced racemes which issue in great numbers from the trunk and the larger branches, and are often several feet long.

Along ravines and watercourses in the DÚN and SAHÁRANPUR DIVISIONS, and also up to 4,000 feet in JAÚNSAR and TEHRÍ-GARHWAL; fairly common.

Wood greyish-brown, rough, moderately hard; weight about 35 lbs. per c. ft. The fibres of the bark are made into coarse ropes. The fruit is eaten, though somewhat insipid. The leaves are good for fodder, and are said to be used for polishing wood.

Fr. ripens in Aug., Sept. or throughout the year.

13. **F. scandens**, Roxb.; Fl. Br. Ind. v. 526; King Fic. 129, t. 162; Brandis For. Flora 421. Vern. *Makhotá*, Jaunsar; *Chhánchri*, Dún and Garhwal.

A climbing shrub, stem often rooting; bark rather thick, horizontally wrinkled, tougher when dry than the porous wood inside. *Leaves* alternate, 2-4 in. long, ovate or elliptic, acute, entire, coriaceous, scabrid above, pubescent beneath; lateral nerves 3-6 pairs above the basal pair; base rounded; petiole 3-7 in., hairy; stipules 2 in., acute. *Receptacles* solitary or in pairs, globose, 3 in. diam., rough, often hairy outside, greenish-yellow when ripe; peduncle 3-6 in. long; basal bracts 3-4, ovate, persistent.

Common in the DEHRA DÚN and JAÚNSAR DIVISIONS, up to 5,000 ft., generally in damp places or not far from watercourses.

Fr. ripens rainy season.

14. **F. foveolata**, Wall.; Fl. Br. Ind. v. 528; King Fic. 183, t. 166-168; Brandis For. Flora 423; Gamble Man. Ind. Timb. 339.



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An evergreen scandent shrub with pubescent shoots and rooting branches. *Leaves* alternate, 2-6 in. long, ovate elliptic oblong or lanceolate, usually acuminate (acumen .5-.7 in. long), entire, membranous or thinly coriaceous, glabrous above, pubescent or glabrescent beneath; lateral nerves 3-6 pairs; base rounded or cuneate, 3-nerved; petiole .5-.8 in., hairy. *Receptacles* .3-.5 in. diam. if globose, twice as long if ovoid, hairy; peduncle .1-.3 in. long; basal bracts 3, ovate, membranous, reflexed.

Generally in the same sort of localities as *F. heterophylla*; rather rare: Robbers' Cave, DEHRA DŪN, 2,500 ft.

15. ***F. palmata***, Forsk.; Fl. Br. Ind. v. 530; King Fic. 146, t. 185. Syn.—*F. virgata* Roxb.; Brandis For. Flora 419; Gamble Man. Ind. Timb. 338. Vern. *Pheri*, Jaunsar; *Khemri*; DŪN; *Anjiri*, N.-W. P.; *Fagwára*, Punjab.

A bush or small tree with smooth grey bark. *Leaves* alternate, 3-5 in. long, orbicular-ovate, acute or apiculate, toothed or serrate, sometimes deeply palmately lobed with the lobes pinnatifid, scabrid above, tomentose beneath; lateral nerves 6-8 pairs, the lowest pair from the base; base truncate or abruptly narrowed to the petiole; petiole .5-1 in. long, pubescent; stipules ovate, acute. MALE FLS. on hairy pedicels. GALL FL.: style lateral, very short; stigma dilated. FEMALE FL.: style subterminal, long, stigma 2-fid. *Receptacle* .5-1 in. diam., usually solitary, subglobose or pyriform, generally pubescent, yellow when ripe; basal bracts 3, acute, deciduous; peduncle .5-.7 in. long.

Common in JAUN SAR and TEHRI-GARHWAL, up to 5,000 ft., also along river banks a long way into the plains, no doubt from seeds brought by flood-water, e.g., the banks of the Jumná, Sông and Súsá: Ámbári, Kánsráu, Khárá, etc.

Wood white, close and even-grained, moderately hard; weight about 40 lbs per c. ft. The leaves are lopped for cattle-fodder, and the fruit is eaten.

New leaves Mar., Apr. Fr. ripen June-Oct.

Closely allied to this species is the Fig-tree, *F. Carica* Linn., Vern. *Anjir*, which is cultivated for its fruit in DEHRA and SAHÁ-RANPUR. Indigenous in Syria, Palestine and Southern Europe.

16. ***F. nemoralis***, Wall.; Fl. Br. Ind. v. 534; King Fic. 161, t. 206; Brandis For. Flora 424; Gamble Man. Ind. Timb. 338. Vern. *Dúdhlá*, Jaunsar; *Parphútá*, *Dúdhlá*, Garhwal. The type of this plant has not been found in the SCHOOL CIRCLE. The following description refers to var. *Fieldingii*, Miq.

A small handsome tree, not epiphytic; bark thin, greyish-brown, fairly smooth. *Leaves* alternate, 4-6 by 1-2 in., lanceolate or elliptic, sharply long-acuminate, quite entire, membranous, glabrous;

main lateral nerves 8-12 pairs rarely more, with regular reticulations between, which are very distinct and dark coloured beneath especially when young; base very acute, 3-nerved; petiole 7-13 in. long, slender; stipules 3-5 in long, convolute, glabrous. MALE FLS. pedicelled, few in the fem. receptacles, numerous in gall-receptacles; *sepals* (in all fls.) 3, lanceolate, fleshy; *stamens* 2-3. GALL FLS. many; *ovary* ovoid, crustaceous. FEM. FLS. few; *ovary* triangularly obovoid; *style* longer than in gall flowers. *Receptacles* 2-3 in. across, axillary, solitary or in pairs, subglobose, glabrous, reddish when ripe; peduncles as long as the receptacles; basal bracts 3, broad, united, persistent.

JAUNSAAR and TEHRI GARHWAL, 3, 7,000 ft.: Chakrata, Jádi, Mautargádh, Mussorie, etc.; often planted about villages.

The leaves are lopped for cattle-fodder, and the ripe fruit is eaten.

Fr. ripens Oct., Nov.

17. **F. Roxburghii**, Wall.; Fl. Br. Ind. v. 534; King Fic. 168, t. 211; Brandis For. Flora 422; Gamble Man. Ind. Timb. 340. Vern. *Timlá*, *Timal*, *Tirmal*, Hind.; *Tirboi*, Jaunsar.

A middle-sized tree with grey warty bark.; young shoots hollow. *Leaves* alternate, 5-15 by 4-12 in. broad-ovate or rounded, acute or mucronate, entire or toothed, subcoriaceous, glabrous or glabrescent above, softly pubescent beneath; lateral nerves 3-6 pairs, joined by transverse veins; base generally deeply cordate, strongly 5-7-nerved; petiole 1-10 in.; stipules 5-1 in., ovate-lanceolate, pubescent. MALE FL: *sepals* large, imbricate; *stamens* 2-3. GALL FLS: *perianth* 2-3-lobed; *style* short, subterminal. FEMALE FL: *Perianth* of gall fl.; *style* long, lateral. *Receptacles* turbinate, depressed, largest 2 in. long and 3 in. broad, tubercled, longitudinally ribbed, purple-orange when ripe, in clusters of 6 to 20 on short thick leafless branchlets from the trunk; peduncle 7-13 in. long, pubescent; basal bracts 3, triangular. *Achene* viscid.

SIWALIK and OUTER HIMALAYA; also JAUNSAAR and TEHRI-GARHWAL, ascending to 5,000 ft. Very common near Ásarori in the DÚN and in the Mautargádh in TEHRI-GARHWAL. Often cultivated for its fruit.

Wood reddish-grey, moderately hard; medullary rays prominent on a radial section; weight 34 lbs. per c. ft. The fruit is eaten; the leaves make a good fodder for cattle and elephants, and are also used for plates.

Fr. ripens Apr.-June.

18. **F. glomerata**, Roxb.; Fl. Br. Ind. v. 535; King Fic. 173, t. 218; Brandis For. Flora 422; Gamble Man. Ind. Timb. 339. Vern. *Gálar*, Hind.



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A middle-sized or large tree; bark smooth, reddish-brown, *Leaves* alternate, 4-7 in. long, ovate- or obovate-oblong or oblong-lanceolate, subacute, entire, membranous, glabrous above when full-grown, generally somewhat pubescent beneath; main lateral nerves 3-7 pairs; base obtuse, rarely acute, 3-nerved; petiole 1-2 in.; stipules 5-1 in., ovate-lanceolate. *Male sepals* inflated. *Gall* and *female perianths* toothed. *Receptacles* subglobose, 1-1.5 in. diam., downy, red or orange when ripe, in short thick paniculate clusters on the trunk and larger branches, rarely axillary; peduncle 3-1 in. long; basal bracts 3, triangular-ovate, small.

Abundant throughout the DÚN and SAHÁRANPUR DIVISIONS, especially in ravines, river banks and marshy places. Not uncommon, in the Tons valley, JAUNSAIR.

Wood grey, soft, mottled on a radial section; weight 25-36 lbs. per c. ft. It is used for making toys and effigies in Bengal, and is said to be durable in water. It is one of the few woods prescribed in Hindu scriptures for sacrificial fires. Birdlime is made of the milky juice. The fruit is eaten raw or cooked. The leaves are used for cattle- and elephant-fodder. Several parts of the tree are used in native medicine.

New leaves Jan.-Apr. Fr. ripens Apr.-July.

9. *Cudrania*, Trecul; G. P. n. 53.

1. *C. javanensis*, Trecul; Fl. Br. Ind. v. 538; Brandis For. Flora 424; Gamble Man. Ind. Timb. 324. Vern. *Mánda*, *Dammar*, Dún.

A straggling shrub, armed with axillary spines; bark smooth, yellowish-brown, with white oblong lenticels, profusely exuding a pale milk when cut. *Leaves* alternate, 1-4 in. long, oblong, elliptic, obovate or oblanceolate, obtuse to acuminate, entire, penninerved; nerves not prominent; petiole 2-3 in. long. *Flowers* dioecious, in globose heads. **MALE FL.:** *sepals* usually 4, oblong, imbricate. *Stamens* 4, erect, included. **FEMALE FL.:** *sepals* broader than in the male. *Ovary* straight; style terminal, simple but with a short rudimentary branch at the base. *Flower-heads* solitary or in pairs, pubescent; male 2-3 in. diam.; female smaller at first, 7-1.2 in. diam. in fruit. *Fruit* an irregularly shaped compound berry, marked outside in a regular pattern by the thickened tips of the perianth-lobes, pinkish-orange when ripe; peduncle 2-3 in. long; seeds nearly as many as flowers in the female head, elliptic, compressed; testa black, crustaceous.

Common in the EASTERN DÚN; also in shady ravines in the SIWALIKS.

Wood tough; heartwood scanty, deep-yellow. The ripe fruit, which has a mawkish sweet taste, is eaten. The leaves are often attacked by a fungus which converts the inner substance into a white brittle mass. This is called *mande-ki roti* and is eaten by village boys.

Fl. Apr.-June. Fr. Aug.-Nov.

In the same Tribe, and allied to *Cudrania*, is the somewhat large Genus, *Artocarpus*, G. P. n. 56, noted for important timber trees, of which, however, none are indigenous in the SCHOOL CIRCLE. Only the following two trees are cultivated in gardens:—

1. *A. integrifolia*, Linn.; Fl. Br. Ind. v. 541. The Jack-tree. Vern. *Kanthál*, *Kathál*, *Kathár*, Hind. A large evergreen tree noted for its dark-green foliage, and huge echinate fruit, which is eaten when ripe or cooked while raw. The wood, which somewhat resembles mahogany, is used for carpentry, and is exported to Europe for various purposes. A yellow dye is extracted from it in Assam and Burma, which is used for dyeing silk.

2. *A. Lakoucha*, Roxb.; Fl. Br. Ind. v. 543. Vern. *Dhéú*, Dún; *Barhái*, Hind.—A large evergreen tree. Leaves large, dark-green, tomentose beneath. Fruit 3-4 in. diam, velvety, yellow when ripe. The wood resembles that of the Jack-tree, though somewhat inferior. The male flower-heads are pickled, and the fruit is eaten both when ripe, and also cooked into a curry while raw. Occasionally wild in damp localities, e.g., Nakraunda and Khairi swamps in the Dún.

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10. *Boehmeria*, Jacq.; G. P. n. 84.

Shrubs or small trees. Leaves opposite or alternate, toothed, 3-nerved; nerves penniveined. Flowers unisexual, in clusters which are axillary or arranged in interrupted axillary spikes racemes or panicles. MALE: Perianth 3-5-lobed, valvate; stamens 3-5, inflexed in bud; pistillode globose. FEMALE: Perianth tubular, narrowed to a 2-4-toothed mouth; stigma lateral, filiform, persistent. Achenes crustaceous, at length free and dry.



71. URTICACEÆ.

[*Bahneria*.]

Analysis of the Species.

- Leaves alternate. A tree. . . . 1. *B. rugolosa*.
Leaves opposite. Shrubs.
Leaves lanceolate, petiole short . . . 2. *B. macrophylla*.
Leaves broad-ovate, petiole long . . . 3. *B. platyphylla*.

1. ***B. rugolosa***, Wedd.; Fl. Br. Ind. v. 577; Brandis For. Flora 403; Gamble Man. Ind. Timb. 324. Vern. *Gēthi*, *Gēpti*, Dún and Garhwal.

A middle-sized or small tree. *Leaves* 3-6 by 1-2 in., alternate, elliptic-lanceolate, closely crenulate or dentate, acuminate, glabrous and dark-green above, pale and velvety beneath, strongly 3-nerved at the base, the nervules anastomosing in an elegant pattern beneath, and forming an intramarginal vein; petiole 7-15 in.; stipules connate. *Clusters* of flowers sessile in simple spikes, each in the axil of a cordate bract; spikes axillary, 3-8 in. long. *Perianth* compressed, ciliate. *Achenes* stipitate, acute at both ends.

Ravines in the OUTER HIMALAYA, up to 4,000 ft. and occasionally along Sub-Himalayan streams: Rájpur, Kálsi, Málköt, banks of the Sông down to Misirwála, etc.

Wood reddish-brown, moderately hard, even-grained, seasons well, mottled on a radial section. It is easy to cut and work, and is used in the hills for making bowls and various kinds of dairy-utensils.

Fl. Rainy season. Fr. Cold season.

2. ***B. macrophylla***, Don; Fl. Br. Ind. v. 577; Brandis For. Flora 403; Gamble Man. Ind. Timb. 324. Vern. *Bará Siáru*, Dún.

A large shrub or small tree with dark-brown bark; branchlets 4-sided, strigose. *Leaves* opposite, 6-12 by 2-3.5 in., lanceolate, very gradually tapering, caudate-acuminate, evenly serrulate, acute or rounded and 3-nerved at the base, hispid, rugulose and pustular above, pubescent beneath; petiole 6-1 in. long, strigose; stipules lanceolate. *Flowers* monœcious, in long drooping simple axillary spikes often as long as the leaves; clusters 2-3 in. diam., subtended by lanceolate bracts. *Fruit* obovate-cuneate, compressed, ciliate.

OUTER HIMALAYAN slopes, e.g., above Rájpur, and in ravines round the Nágsidh hill in the DÚN; not very common.

The branches yield a strong fibre which is used for fishing lines, nets, and such other purposes.

Fl. Aug., Sept. Fr. Nov.-Jan.

3. B. platyphylla, Don; Fl. Br. Ind. v. 578; Brandis For. Flora 403; Gamble Man. Ind. Timb. 325. Vern. *Bimol*, Rajpur; *Siár*, Kálsi; *Khákshá*, Garhwal.

A shrub, often up to 10-12 ft. high, branches rough, dark-brown. *Leaves* usually opposite, 4-9 by 3-7 in., broad-ovate or orbicular, acuminate or caudate, closely dentate, scaberrulous or glabrate, rather membranous; base cordate or rounded; margins and teeth strongly reticulate; petiole 1.5-8 in. long. *Flowers* whitish, monœcious or dioecious. *Male spikes* often branching, generally not exceeding the leaves. *Female spikes* (in the typical form) much exceeding the terminal leaves, brown when the achenes are dry. *Fruit* compressed or angled.

Common in the OUTER HIMALAYA, and in shady ravines and along streams throughout the DÚN.

Wood moderately hard, but hardly of any size to be of much use except for fuel. The bark yields a shining-white strong fibre, very good for rope, and probably also for textile purposes. The leaves make a good fodder for cattle.

Fl. Apr.-Aug. Fruiting spikes Oct.-Dec.

I have noticed two distinct varieties of this plant in the DÚN: one the typical form described above, with long slender flexuose fruiting spikes; and the other, a small undershrub, with rougher and thicker leaves, and shorter, stouter and erect fruiting spikes;—Var. *Scabrella*, Wedd.?

11. Pouzolzia, Gaud.; G. P. n. 86.

1. P. viminea, Wedd.; Fl. Br. Ind. v. 581; Brandis For. Flora 405; Gamble Man. Ind. Timb. 325.

A shrub with slender branches; bark thin, rough, grey. *Leaves* alternate, 1-6 by .2-1.5 in., oblong or ovate-lanceolate, dentate or serrate, acuminate, rather rough above, somewhat hirsutely grey-tomentose beneath; base rounded, strongly 3-nerved; nerves penniveined; petiole 3-1.5 in. long. *Flowers* usually monœcious, bracteate, in sessile axillary clusters. *MALE FL.*: *Perianth* 4-5-partite, segments valvate; stamens usually 4, inflexed in bud. *FEMALE FL.*: *Perianth* tubular, narrowed and toothed above; stigma lateral, filiform, deciduous. *Achenes* enclosed in the persistent chaffy perianth.

Occasionally met with in moist shady ravines in the DÚN and in JAUNSAIR. Nakraunda and Gángbhewá swamps; banks of the Tons near Kálsi, etc.

The wood is not of much use except for fuel. The leaves are eaten cooked in Sikkim, and the bark is used to make ropes.

Fl. Rainy season.

12. *Villebrunea*, Gaud. ; G. P. n. 94.

1. **V. frutescens**, Bl.; Fl. Br. Ind. v. 590; Brandis For. Flora 406; Gamble Man. Ind. Timb. 325. Vern. *Gar-tushiári*, *Poidhāulā*, Kumaun.

A shrub with slender pubescent branches; bark dark-grey, rough. *Leaves* alternate, 3-6 by 1·5-3·5 in., ovate or elliptic, acuminate, finely serrate or crenate, membranous, concolor or grey beneath, sparsely strigose or glabrate, penninerved in the upper half; base rounded or slightly sub-cordate, 3-nerved; petiole ½-3 in. long, very slender; stipules lanceolate. *Flowers* usually diœcious, in subsessile clusters or short cymes in the axils of previous year's leaves. *Male perianth* valvate. *Female perianth* and bracteoles fleshy and juicy in the ripe fruit.

JAUNSAIR and DEHRA DÚN up to 5,000 ft., generally along watercourses; fairly common. Dhármigádh; Nakraunda, etc.

The bark gives a useful fibre.

Fl. and Fr. Apr. and May to Sept. and Oct.

13. *Debregeasia*, Gaud. ; G. P. n. 95.

Shrubs or small trees. *Leaves* alternate, serrate, 3 nerved; stipules 2-fid. MALE FLS. clustered; *sepals* generally 4, valvate; *stamens* as many as the sepals, inflexed in bud; *ovary* rudimentary. FEMALE FLS. in small fleshy heads; *perianth* very minute, tubular, with a contracted mouth; *ovary* straight, included; *stigma* generally sessile, tufted. *Achenes* enclosed in the fleshy perianth; heads succulent when ripe.

Analysis of the Species.

Flower-heads in dichotomous cymes; leaves ash
beneath.

1. *D. velutina*.

Flower-heads sessile or subsessile; leaves white
beneath.

2. *D. hypoleuca*.

1. **D. velutina**, Gaud.; Fl. Br. Ind. v. 590. Syn.—*D. longifolia*, Wedd.; Brandis For. Flora 405; Gamble Man. Ind. Timb. 326. Vern. *Túshiári*, Dún; *Sansáru*, E. Dún; *Siáru*, Mussorie.

A moderate-sized shrub; bark thin, dark-brown. *Leaves* 3-5 by 4-1 in., oblong or linear-elliptic, acute at the base, acuminate,

serrulate, rugose, scabrid and dark-green above, ashy-tomentose beneath; petiole up to 1 in. long. *Flowers* monœcious (*Sir D. Brandis*), in small heads which are disposed in short sessile dichotomous cymes. *Male perianth* longer than the bracteoles. *Heads* yellow when ripe, with numerous drupes imbedded in it.

OUTER HIMALAYAN valleys and the Dún; also at low elevations in JAUNSAK and TEHRI-GARHWAL: Dúdhli, Sansárú Khálá, above Rájpur; Bámsu, etc.

The stem yields a strong fibre which is made into rope. The ripe fruit is eaten.

Fl. July, Aug. Fr. Nov.-Jan.

2. **D. hypoleuca**, Wedd.; Fl. Br. Ind. v. 591. Syn.—*D. bicolor*, Wedd.; Brandis For. Flora 405; Gamble Man. Ind. Timb. 326. Vern. *Túshidri*, Garhwal and the Dún; *Sansárú*, E. Dún; *Siár*, *Siñár*, Jaunsar; *Siárú*, Mussoorie.

A large evergreen shrub with pubescent branches; bark thin, dark-grey. *Leaves* alternate, 3-6 by 1-2 in., oblong- or linear-lanceolate, acuminate, serrulate, rather coriaceous, scabrous and with round elevated dots above, thickly white-felted beneath; base acute or rounded, 3-nerved, the midrib much stouter than the two side-nerves; lateral nerves 3-5 pairs above the basal; petiole 1-1 in. *Flowers* generally dicecious, in sessile or subsessile axillary heads. *Female perianth* ovoid, succulent in fruit. *Stigma* sessile, tufted. *Fruit* an amber-coloured fleshy berry, studded with the minute nuts (somewhat like strawberry), sweet, but insipid and mucilaginous.

Common along watercourses in the OUTER HIMALAYA and also in JAUNSAK and TEHRI-GARHWAL, generally between 2,000 and 5,000 ft., sometimes ascending to 6,500 ft. (e.g., Lúrlí Block, Chakratá; also Mussoorie). Extremely abundant in the Sansárú Khálá, MÁLKÓT FOREST, 3,500 ft., which has been named after it.

The wood is grey, soft and light, not of much use. The fibre is made into twine and rope, and the ripe fruit is eaten.

Fl. Mar., Apr. Fr. June-Aug.

14. *Maoutia*, Wedd.; G. P. n. 97.

1. **M. Puya**, Wedd.; Fl. Br. Ind. v. 592; Brandis For. Flora 406; Gamble Man. Ind. Timb. 323. Vern. *Poi*, *Puá*, Hind. *Dhaul* (white) *Khágshi*, Dún; *Cháwá*, Kálsi.

A shrub with hairy shoots; bark dark-grey, with vertical lines of brown lenticels. *Leaves* alternate, 4-8 by 2-7 in., elliptic, caudate-acuminate, coarsely dentate or crenate with 15-20 teeth on either side, membranous, scabrid above, softly white-felted beneath;



71. URTICACEÆ.

[*Macoutia*-
SL

base rounded or sub-acute, 3-nerved; lateral nerves 3-4 pairs; veins transverse; petiole 5-4 in. long slender, pubescent. *Flowers* monœcious or dicecious, very minute, in small heads which are disposed in axillary dichotomous cymes or panicles; inflorescence generally with a small rudimentary branchlet bearing minute leaves at the same leaf-axil. *Male sepals* 5, valvate. *Stamens* 5, inflexed in bud. *Female perianth* none. *Nuts* triquetrous.

Fairly common in the SUB-HIMALAYAN RAVINES: Banks of the Tons Râu (DEHRA DÛN), Kâlsi, Paléd, etc. Also in the SIWALIKS, e.g., the Mohand Pass.

The plant gives a fine white strong fibre, which is used to make fishing-nets, twine and cloth.

Fl. and Fr. May-Nov.

In the same Section, URTICACEÆ, are several Genera of annual or perennial herbs with stinging hairs commonly known as nettles, which are fairly well represented in the SCHOOL CIRCLE. The nettles are remarkable for strong fibres. The largest is *Girardinia heterophylla*, Dene.; Fl. Br. Ind. v. 550. Vern. *Bichchhâ*, Hind.; *Kâshki*, Jaunsar. Common throughout the DÛN, and in the HILLS up to Deoban.—*G. P. n. 77.*

Belonging to quite a small Section of URTICACEÆ, which is destitute of woody plants, is the wild Hemp *Cannabis sativa*, Linn., Fl. Br. Ind. v. 487. Vern. *Bhâng*, Hind.,—an annual weed of camping grounds and roadsides in the DÛN, but is also found in all camping places throughout the HILLS. *Leaves* palmatipartite, lobes finely serrate. It gives a strong fibre, quite fit for rope.—*G. P. n. 15.*

ORDER 72. JUGLANDEÆ; G. P. N. 156.

Trees, often strongly aromatic. *Leaves* alternate, pinnate, exstipulate. *Flowers* monœcious, bracteate. **MALE FL.** in lateral catkins. *Perianth* none or rudimentary. *Stamens* 2-40, on lateral bracts; filaments short; anther-cells parallel. **FEMALE FL.** subsolitary or spicate. *Calyx* adnate to the ovary; limb superior, 4-toothed. *Petals* minute or none. *Ovary* 1-celled, 1-ovuled; style 2-fid. *Fruit* a 1-seeded 2-valved nut or drupe; cotyledons contorted or corrugated.

Analysis of the Genera.

- Fem. fl. subsolitary; bracts not enlarged in fr. . 1. JUGLANS.
Fem. fl. spicate; bracts produced into a wing in fr. 2. ENGELHARDTIA.

1. Juglans, Linn.; G. P. n. 2.

1. **J. regia**, Linn.; Fl. Br. Ind. v. 595; Brandis For. Flora 497; Gamble Man. Ind. Timb. 392. The Walnut. Vern. *Akhrot*, Hind.; *Akhôr*, *Okhâr*, Jaunsar.

A large aromatic deciduous tree with velvety shoots; bark grey, longitudinally fissured. *Leaves* imparipinnate, 6-15 in. long, thickly tomentose while young. *Leaflets* 5-13, lateral subsessile, opposite or subopposite, 3-8 by 2-4 in., elliptic-oblong, generally entire, rather coriaceous, glabrescent or pubescent along the nerves beneath; lateral nerves 15-20 pairs. *Male catkins* green, 2-5 in. long, sometimes in pairs, in the axils of previous year's leaves; bracts stalked, oblong, lobed. *Stamens* 10-20 or more. *Female fl.* 1-3, opposite the terminal leaf. *Calyx* indistinctly 4-toothed. *Petals* 4, green, narrow-lanceolate, minute, in the sinuses between the calyx-teeth. *Stigmas* more or less fleshy. *Fruit* 2 in. long, ovoid, glabrous or pubescent, green, with yellow dots; pericarp leathery, very aromatic. *Nut* 1-1.5 in. long, ribbed, more or less thick-shelled, 2-valved; cotyledons irregularly corrugated, 2-lobed at the back.

Wild throughout JAUNSAAR and TEHRI-GARHWAL, between 4,000 and 10,000 ft., and generally cultivated about villages in the hills.

Heartwood greyish-brown with darker streaks, often mottled, even-grained, moderately hard, seasons and polishes well; weight 40-50 lbs. per c. ft. It is in great demand for gun-stocks and is used for ornamental furniture throughout the Himalaya. The bark is used as a dye and in medicine, and is exported to the plains for cleaning the teeth. The nut is a well-known article of commerce, and the rind of the unripe fruit is used to intoxicate fish, and for tanning and dyeing. The leaves are used for cattle-fodder. The tree attains an enormous size, as much as 100 to 120 feet in height and 28 feet in girth. The cultivated trees, however, have a low spreading crown not more than 50 feet high, and a short trunk about 8 or 10 ft. in girth.

Leafless in cold weather. New leaves and fl. Feb.-April. Fr. July-Sept.

2. Engelhardtia, Leschen.; G. P. n. 4.

1. **E. colebrookiana**, Lindl.; Fl. Br. Ind. v. 596; Brandis For. Flora 499; Gamble Man. Ind. Timb. 393. Vern. *Mowâ*, *Mauwâ*, Jaunsar (Tons valley).

A small deciduous tree with grey bark; young shoots tomentose. *Leaves* imparipinnate, 8-12 in. long. *Leaflets* 6-11, the terminal smallest, often absent (by abortion), the lateral sub-opposite, short-petioluled, 3-5 in. long, obovate or elliptic-oblong, obtusè or acute, entire, subcoriaceous, glabrescent above, densely tomentose beneath; main lateral nerves 8-12 pairs; base unequal-sided, sometimes half acute and half rounded. **MALE FL.** in cylindrical lateral catkins, or exceptionally at the lower-half of female spikes. *Perianth* 3-6-lobed, adnate to a 3-lobed stipitate bract. *Stamens* 4-12; filaments very short. **FEMALE FLS.** in drooping bracteate spikes 5-8 in. long. *Calyx* adnate to the ovary, 4-toothed. *Stigmas* 2, linear, papillose. *Fruit* a small globose nut, 2.3 in. diam., villous, adnate to the much enlarged 3-lobed bract; lobes of bract with a straight midrib and reticulate veins; middle lobe 1.1-3 in. long; lateral lobes .7 in. long.

Common and often gregarious in the MĀLKŌT and MUSSOORIE HILLS and in the Tons valley, JAUNSAR, and also, according to Sir D. Brandis, in the SIWĀLIK TRACT and N.-W. HIMALAYA up to 6,500 ft., but has not, so far, been met with in the SAHĀRANPUR-SIWĀLIK or anywhere above 5,000 ft. in the SCHOOL CIRCLE.

The wood is reddish-grey, even-grained, moderately hard, seasons and polishes well, but is not durable; weight 33 lbs. per c. ft. The leaves and branches are burned for use as manure.

Leafless Dec.-Feb. New leaves and fl. Mar., Apr. Fr. May, June.

ORDER 73. MYRICACEÆ; G. P. N. 157.

Aromatic trees or shrubs. *Leaves* alternate, simple, exstipulate. *Flowers* monœcious or diœcious, in bracteate catkin-like spikes. *Perianth* none. **MALE FL.:** *Stamens* generally 3-6, on a torus adnate to the bract; filaments free or connate at the base. **FEMALE FL.:** *Ovary* sessile, 1-celled, 1-ovuled; style 2-fid. *Fruit* a resinous drupe with a hard endocarp.

1. *Myrica*, Linn.; G. P. n. 1.

1. **M. Nagi**, Thunb.; Fl. Br. Ind. v. 597. Syn.—*M. sapida*, Wall.; Brandis For. Flora 495; Gamble Man. Ind. Timb. 391. Vern. *Kāiphal*, Hind; *Kāphal*, Jaunsar.

A moderate-sized evergreen tree; bark brownish-grey, rough, vertically wrinkled. *Leaves* 3-7 by 1-2 in., lanceolate, oblanceolate or



obovate, obtuse or acute, serrate on young plants, entire on old trees, coriaceous, glabrous above, pale or rust-coloured and with resinous dots beneath; midrib stout; main lateral nerves 12-20 pairs, anastomosing at the ends to form an intramarginal vein; base very acute; petiole 3-6 in. long. *Male spikes* solitary fascicled or paniced, sometimes with female flowers at the top. *Female spikes* axillary, slender. *Fruit* 7 in. long, ellipsoid or ovoid, somewhat compressed, tubercled, reddish or yellowish-brown when ripe; pulp reddish, formed of radiating fleshy hairs; nut rugose.

JAUNSAK and TEHRI-GARHWAL, 3,-6,000 ft. : Korwá, 6,000 ft. ; Gádhs in the Tons valley ; etc. Also MÁLKÔT HILLS, 4,-5,000 ft.

The wood is purplish-grey, hard and close-grained, but apt to split and warp ; weight 58 lbs. per c. ft. It is good for fuel. The bark is used as an aromatic stimulant, and externally as a plaster for rheumatism. It is also used to poison fish. The fruit is eaten and makes a very refreshing sherbet in the hot weather when it ripens.

New leaves Apr., May. FL. Oct.-Dec. Fr. May, June.

ORDER 74. CUPULIFERÆ ; G. P. N. 159.

Trees or shrubs. *Leaves* alternate, simple, stipulate. *Flowers* generally monœcious. *MALE FL.* in catkin-like spikes ; *sepals* 1-5, or absent ; *stamens* 2-20, on a hairy torus. *FEMALE FL.* solitary or in dense spikes or heads ; *perianth* adnate to the *ovary*, or absent ; *ovary* 2-3- rarely more- celled ; style-arms as many as cells in the ovary ; ovules 1 or 2, pendulous. *Fruit* included within, or in the axils of, enlarged bracts ; seed pendulous, exalbuminous.

This Order includes the following Tribes represented in the SCHOOL CIRCLE by the Genera analysed under them :—

I. BETULÆ.—*Male perianth* of 4 or fewer segments ; *fem. perianth* absent. *Female flowers* many in dense spikes. *Ovary* 2-celled ; cells 1-ovuled.

- | | |
|---|---------------|
| Scales of female spikes thin, deciduous | . 1. BETULIA. |
| Scales of female spikes woody, persistent | . 2. ALNUS. |

II. **CORYLÆ.**—*Male perianth* absent; *female perianth* adnate to the ovary. *Female flowers* in pairs in the axils of bracts that are much accrescent in fruit. *Ovary* 2-celled; cells 1-ovuled.

Bracts many, in long spikes, leafy and veined in fr. 3. **CARPINUS.**

Bracts few, in very short spikes, coriaceous in fr. 4. **CORYLUS.**

III. **QUERCINEÆ.**—*Male perianth* 4-10-lobed; *female perianth* adnate to the ovary. *Female flowers* few in an involucre of bracts. *Ovary* 3-7-celled; cells 2-ovuled.

Bracts many, small, adpressed, usually imbricate 5. **QUERCUS.**

1. BETULÆ.

1. *Betula*, Tourn.; G. P. n. 1.

Deciduous trees or shrubs; outer bark papery, peeling off in horizontal rolls. *Leaves* penninerved, toothed or serrate; stipules deciduous. *Flowers* monœcious, spicate. **MALE SPIKES** drooping; *bracts* stalked, peltate, bearing on the inner face 2-3 bracteolate flowers; *sepals* 2-4. *Stamens* 2; filaments forked, separating the anther-cells. **FEMALE SPIKES** erect or pendulous; *bracts* imbricate, each with two bracteoles on either side; *perianth* none. *Ovary* compressed; styles 2; stigmas terminal. *Fruit* a 1-seeded winged lenticular nut.

Analysis of the Species.

Female spikes sub-solitary, erect; bracts coriaceous, wider than the wings of the nut.

1. *B. utilis.*

Female spikes paniced, sub-erect; bracts membranous, narrower than the wings of the nut.

2. *B. alnoides.*

1. ***B. utilis***, Don; Fl. Br. Ind. v. 599. Syn.—*B. Bhojpatra*, Wall.; Brandis For. Flora 457; Gamble Man. Ind. Timb. 372. Vern. *Bhújpattra*, Hind.; *Bhúj*, Jannsar and Garhwal.

A moderate-sized tree; bark brownish-white, with numerous horizontal lenticels; extremities pubescent. *Leaves* 2-3 by 1·5-2·2 in., ovate, acuminate, irregularly serrate, pubescent when young, gland-dotted and hairy along the nerves beneath; lateral nerves 8-12 pairs; petiole 3-6 in.; stipules oblong, 5 in. long. *Bracts* of male fl. ciliate, stalk scaly; anther-cells distinct. *Bracts* of female fl. pubescent, 3-lobed, hardened in fruit. *Male spikes* 4-5 in. long, 2-3 in. diam.



Female spikes erect, 1-2 in. long, .5-.6 in. diam. *Nut* with narrow wings.

TEHRI-GARHWAL, between 10,000 and 14,000 ft. and occasionally in JAUNSAK. Gregarious in higher elevations with *Rhododendron Anthopogon* as an undershrub, e.g., at Cháchpur, Chánsil, Harki-Dún and Gangottari. Sporadic specimens occur at such places as Bhújkoti, Deotá, Lambátách Peak, etc.

The wood is pinkish-white, even-grained, tough and elastic; weight 44 lbs. per c. ft. It seasons well and does not warp, and is used for building in the inner arid Himalaya. The bark, however, is by far the most valuable part of the tree. It is used as paper for writing and packing, for umbrella covers, as a lining inside hooka-tubes, and for roofing houses. The leaves are lopped for cattle-fodder.

Leafless Oct.-Mar. New leaves and fl. Apr., May. Fr. Aug.-Oct.

2. **B. alnoides**, Ham.; Fl. Br. Ind. v. 599. Syn. — *B. acuminata*, Wall.; Brandis For. Flora 458; Gamble Man. Ind. Timb. 372. Vern. *Kath Bhúj*, Jaunsar.

A moderate-sized tree; young shoots pubescent; rolls of bark thicker and lenticels shorter than in the last species. *Leaves* 3-6 by 2.3-5 in., ovate or ovate-lanceolate, sharply acuminate, very irregularly and doubly serrate, pubescent beneath when young, gland-dotted when old; lateral nerves 10-15 pairs; base from rounded to cordate; petiole .5-.7 in. long, hairy; stipules lanceolate, .3 in. long. *Bracts, stamens* and *ovary* hairy; male bracts sub-sessile. *Male* and *female* spikes fascicled or paniced, nearly of the same size, 2-5 in. long, .2-.3 in. diam. *Nut* with wings broader than itself.

Fairly common in JAUNSAK and TEHRI-GARHWAL, 5-, 10,000 ft., with a somewhat gregarious tendency (e.g., Tátuágádh, Mundáli).

The wood is white, fairly close-grained, but not very hard in Jaunsar, although esteemed for strength and durability in Nepal. Weight 41 lbs. per c. ft. The leaves are lopped for fodder. The bark, peeling off in somewhat stiff narrow bands, cannot be used in the same way as that of the preceding species.

Leafless in winter. Fl. Nov., Dec. Fr. Apr., May.

2. *Alnus*, Tourn.; G. P. n. 2.

The Alders.

Deciduous trees. *Leaves* alternate, penninerved, often with tufts of hairs beneath in the axils of the lateral nerves. *Flowers* monœcious. **MALE FLS.** in pendulous spikes, supported by bracts and bracteoles; bracts 3-fid;



sepals 4. *Stamens* 4; anthers subsessile, cells connate. FEMALE FLS. 2 in the axil of each bract, in short erect spikes; bracts woody, persistent in fruit. *Styles* 2, stigmatose at the tips. *Fruit* a woody cone; nuts more or less winged.

Analysis of the Species.

- Bark smooth, silvery-grey; fruiting spikes many,
in large erect panicles. 1. *A. nepalensis*.
Bark furrowed, brown; fruiting spikes solitary,
or 3-5 in short erect racemes. 2. *A. nitida*.

1. *A. nepalensis*, Don; Fl. Br. Ind. v. 600; Brandis For. Flora 460; Gamble Man. Ind. Timb. 373. Vern. *Puzāla*, Jaunsar; *Kūnis*, Tehri-Garhwal.

A large tree; branchlets glabrous; bark compact, silvery-grey. *Leaves* 3-7 by 2-3·5 in., elliptic or elliptic-lanceolate, acute, entire or denticulate, glabrous above, slightly glaucous beneath; nerves 10-18 pairs; base usually narrowed; petiole generally 3·5 in., sometimes much longer. *Male spikes* 4-10 in. long, short-peduncled, slender, in terminal drooping panicles. *Fem. spikes* 2-3 in., pendulous in flower. *Fruit spikes* 5-1 by 3 in., ovoid or cylindrical, short-peduncled, in lateral panicles. *Nuts* with a membranous wing.

JAUNSAR and TEHRI-GARHWAL, 3,900 ft.: Chakrata, Lambātach, Deotā, Tons valley, etc. Generally in ravines or banks of streams.

Wood reddish-white, close and even-grained, soft but tough. Medullary rays broad, with numerous fine ones between. Weight about 30 lbs. per c. ft. It is used for bedsteads and for the hooked sticks in rope bridges. The bark is used for dyeing and tanning.

Fl. Oct.-Dec. Fr. ripens in winter but remains long on the tree.

2. *A. nitida*, Endl.; Fl. Br. Ind. v. 600; Brandis For. Flora 460; Gamble Man. Ind. Timb. 373. Vern. *Ūtis*, *Kūnis*, Jaunsar.

A large tree; new shoots and petioles pubescent; bark dark-brown, deeply furrowed. *Leaves* 4-6 by 2-3·5 in., elliptic or elliptic-ovate, acuminate, entire or obscurely crenate, glabrous; nerves 8-12 pairs; base generally cuneate; petiole 1-1·5 in. *Male spikes* 2-4 in. long, in erect terminal racemes; peduncle 3-6 in. *Female spikes* 1-2 by 7 in. *Fruit spike* 7-1·5 by 5 in., ovoid, in erect racemes. *Nuts* with a thickened margin.

JAUNSAK and TEHRI-GARHWAL, usually at low elevations, generally fringing the banks of rivers and streams, e.g., the Tons and Pábar rivers; Thádiar, Morágádh, etc.

Wood similar to that of *A. nepalensis*, but somewhat lighter. The economic uses also are the same as of that species.

Fl. Sept., Oct. Fr. ripens in winter but remains long on the tree.

II. CORYLEÆ.

3. *Carpinus*, Tourn.; G. P. n. 3.

The Himalayan Hornbeams.

Deciduous trees with slender flexuose branchlets. *Leaves* alternate, membranous, serrate; lateral nerves many, straight, parallel, very regular; buds elongate. *Flowers* monœcious. MALE FLS. in drooping lateral spikes, ebracteolate; *perianth* none; *stamens* 3-4 on a hairy torus, filaments forked separating the anther-cells. FEMALE FLS. in slender terminal spikes, in pairs at the base of a foliaceous bract; bracteoles 2; *perianth* superior; *ovary* 2-celled, 2-ovuled; *style-arms* 2, filiform. *Nut* ribbed, at the base of the much-enlarged leafy bract and bracteoles.

Analysis of the Species.

Leaves ovate-lanceolate, caudate; fruiting bracts lanceolate; branches verrucose 1. *C. viminea*.

Leaves ovate-oblong, acute; fruiting bracts triangular; branches soft-tomentose 2. *C. faginea*.

1. *C. viminea*, Wall.; Fl. Br. Ind. v. 626; Brandis For. Flora 492; Gamble Man. Ind. Timb. 390. Vern. *Shiproi*, *Shángri*, Jaunsar; *Chamkharik*, Hind.

A middle-sized tree; branches warted; stem irregularly fluted; bark compact, grey, with darker streaks. *Leaves* 3-4 in. long, ovate-lanceolate, caudate-acuminate, doubly serrate up to the tip, glabrous; base rounded or sub-cordate; petiole 1-5 in. long, hairy. *Male spikes* 1-2 in.; *female* 2-4 in. long. *Fruiting bracts* 1 in. long, lanceolate, unequal-sided, toothed on the broader side, often lobed at the base on the other side, 3-5-nerved. *Nut* 1 in. long, glandular.

JAUNSAK and TEHRI-GARHWAL, 5,7,000 ft., often in shady ravines and along watercourses.



Wood white, shining, moderately hard, warps in seasoning, believed to be durable; no heartwood; weight 50 lbs. per c. ft. It is used chiefly for fuel.

Fem. fl. and new leaves Mar., Apr.; male fl. shortly before the leaves.

2. **C. faginea**, Lindl.; Fl. Br. Ind. v. 626; Brandis For. Flora 492; Gamble Man. Ind. Timb. 390. Vern. *Gish*, Garhwal; also the names given to the last species.

A middle-sized tree; branches pubescent; bark dark-brown, smooth, slightly wrinkled. *Leaves* 3-5 in. long, ovate-oblong, often falcate, acute, generally with simple serratures, glabrescent; base rounded or sub-cordate, sometimes oblique; petiole 1-3 in. long, hairy. *Male spikes* 1-2 in., *fem.* 2-3 in. long. *Fruiting bracts* 6-7 in. long, 4-6-nerved, pubescent along the nerves beneath, triangular-oblong, very unequal-sided, coarsely toothed and often also lobed on the broader side. *Nut* 1 in. long.

Between 6,000 and 7,000 ft. in TEHRI-GARHWAL: Sâhlrâ. Upper Tons valley. Rather rare (?) in JAUNSAH.

Wood similar to that of the last species.

Fl. Mar., Apr. Fr. July, Aug.

4. *Corylus*, Linn.; G. P. n. 6.

1. **C. colurna**, Linn.; Fl. Br. Ind. v. 625; Brandis For. Flora 494; Gamble Man. Ind. Timb. 390. The Himalayan Hazel. Vern. *Kapâsi*, *Shârori*, Jaunsar; *Bhutîâ Badâm*, Hind.

A moderate-sized deciduous tree; bark dark-grey, thin, sometimes exfoliating upwards. *Leaves* 3-6 in. long, rather membranous, ovate or obovate, acuminate, often slightly lobed, unequally and doubly serrate, glabrous when mature; lateral nerves 10-12 pairs, straight, generally pubescent beneath, each terminating in a large tooth; base cordate; petiole 7-1.5 in. long, glandular-pubescent; stipules 6 in. long, lanceolate, hairy; leaf-buds rounded, in hairy ovate scales. *Flowers* monœcious. *MALE FLS.* 1 in each bract; *perianth* 0. *Stamens* usually 4; filaments forked, separating the anther-cells; spikes fascicled, 1-2 in. long, cylindrical, drooping. *FEM. FLS.* in pairs in the upper bracts of a small many-bracteate bud-like spike; *perianth* superior. *Ovary* 2-celled, 2-ovuled. *Nuts* 1-seeded, 5-7 in. long, globose, somewhat compressed, hard, deep-brown, 2-3 together in a ribbed coriaceous double-involucre.

JAUNSAH and TEHRI-GARHWAL, 5,500 to 10,000 ft., generally in shady places and northern aspects; not gregarious.

Wood pinkish-white, moderately hard; annual rings distinct; medullary rays fine, numerous; weight 35 lbs. per c. ft. It is used

locally for various purposes. The fruit is as good as English Hazel-nut, and is an important article of food in the hills, where the tree is cultivated for its sake.

New leaves and fl. Mar., Apr. Fr. July, Aug.

III. QUERCINEÆ.

5. *Quercus*, Linn.; G. P. n. 7.

The Oaks.

Deciduous or evergreen trees. *Leaves* alternate, pinninerved, generally serrate. *Flowers* monœcious. MALE FL. usually in drooping spikes; *perianth* campanulate; *stamens* 6-12 or more; filaments slender, anther-cells connate. FEMALE FL. solitary or in clusters or short spikes, each enclosed in an involucre of bracts; *perianth-tube* adnate to the ovary; limb minutely toothed; *ovary* 3-5-celled with 2 ovules in each cell; *styles* 3-5. *Nut* (usually called an *acorn*) 1-celled, seated in a cup of hardened bracts; seeds 1 or 2; cotyledons thick, fleshy.

Analysis of the Species.

Cupular bracts imbricate, tips free.

Mature leaves rusty-tomentose beneath;

fruit globose, less than half buried in the cup

1. *Q. semecarpifolia*.

Mature leaves glabrous, green beneath;

fruit ovoid, half buried in the cup.

2. *Q. dilatata*.

Mature leaves white-tomentose beneath;

fruit conical, more than half buried in the cup

3. *Q. incana*.

Cupular bracts connate into concentric

belts; leaves glaucous beneath.

4. *Q. glauca*.

1. *Q. semecarpifolia*, Smith; Fl. Br. Ind. v. 601, Brandis For. Flora 479; Gamble Man. Ind. Timb. 382. Vern. *Kharshu*, Jaunsar.

A middle-sized or large tree, generally evergreen; young parts clothed with soft hairs; bark dark-grey, cracked into more or less 4-sided scales. *Leaves* 2-5 by 1-3 in., elliptic or oblong, spinous-toothed on young trees, often entire on old trees, coriaceous, glabrous and dark-green above, generally rusty-tomentose beneath; lateral nerves 6-12 pairs, bifurcating, impressed above; base cordate



or rounded; petiole 0·2 in. *Male spikes* crowded, 2-4 in. long and congested in seed-years, 4-8 in. long and interrupted in other years; *perianth-segments* obtuse, ciliate; *stamens* indefinite, anthers apiculate. *Fem. spikes* short, at the tip of the current year's shoots; *styles* long, recurved. *Acorn* solitary, on previous year's shoots, 1 in. diam., globose, black when ripe; cup ·5 in. diam., thin, enclosing about a third of the nut.

JAUNSAK and TEHRI-GARHWAL, 8,500 to 10,000 ft., generally gregarious, often mixed with spruce and silver firs, occupying a higher zone than any other oak found in the SCHOOL CIRCLE. It is the most important fuel-tree in the Deoban Range.

Heartwood reddish-grey, very hard. Annual rings not very distinct. Medullary rays of two kinds; a few broad rays with numerous very fine ones between. Weight 53 lbs. per c. ft. The wood splits in seasoning. It is used only locally for building, door-frames, bedsteads, ploughs, and mule-saddle, and is a good fuel. It might, as also the wood of *Mōru*, be useful in the plains, but they are too heavy to be floated. The leaves make a good cattle-fodder, and bears are extremely fond of the acorns. The tree coppices well. It seeds profusely every second or third year, but a few trees here and there bear acorns every year. Trees that bear acorns do not shed leaves that year, whereas those which produce male flowers are generally leafless by the middle of May.

New leaves and fl. May, June. The female flowers appear with the male flowers and become fertilized by their pollen, but the acorns begin to grow only in the next spring, often before the male flowers of the season have begun to open. By the first week of June the young acorns are about the size of a pea, while the female flowers (which will produce acorns next year) are then just visible. This peculiarity of fructification is, *mutatis mutandis*, common to all (?) the Oaks found in the SCHOOL CIRCLE. Fr. Aug., Sept.,—15 months after flowering.

2. *Q. dilatata*, Lindl.; Fl. Br. Ind. v. 602; Brandis For. Flora 482; Gamble Man. Ind. Timb. 383. Vern. *Mōru*, Jaunsar.

A large shade-enduring tree, almost evergreen; bark dark-grey or black, peeling off in longitudinal scales. *Leaves* 1·5-3·5 by ·5-1·7 in., oblong or oblong-lanceolate, acuminate, entire or spinous-serrate, coriaceous, quite glabrous when mature; lateral nerves 8-12 pairs, slender, forked and reticulate; base rounded or cordate; petiole ·2-·3 in. long. *Male spikes* crowded, drooping, lax, 1·5-3 in. long; bracts lanceolate. *Fem. spikes* short; *styl s* 3-5, linear-clavate. *Acorn* solitary, on previous year's shoots, ·7-1·2 in. long, ·5-·7 in. diam., ovoid or oblong, glabrous, brown when ripe; scales of cup closely adpressed.

JAUNSAK and TEHRI-GARHWAL, 6,500 to 9,000 ft., occupying a zone intermediate between that of *Bān* and *Kharshu*, often gregarious, but generally associated with the firs and Deodar.

Heartwood reddish-grey, with darker streaks, very hard, seasons well. The broader medullary rays are more numerous but narrower than those of any other species described here; the others very fine, very numerous, and uniform; annual rings indistinct; weight 61 lbs. per c. ft. The wood is the most useful of all the Oaks in the School Circle. It is used for building, for agricultural implements, axe-handles, walking-sticks, jhampān-poles, soles of sledges and similar other purposes. The leaves are lopped for fodder. The tree reproduces itself freely both from seed and from coppice-stools. A kind of gall-insect produces galls on the leaves, which are sweet to the taste, and are eaten by the Jaunsaris, insects and all.

New leaves and fl. Apr., May. Fr. Cold season,—16-18 months after flowering.

3. *Q. incana*, Roxb.; Fl. Br. Ind. v. 603; Brandis For. Flora 482; Gamble Man. Ind. Timb. 384. Vern. *Bān*, Jaunsar; *Bānj*, Garhwal.

A large evergreen tree; bark dark-grey, rough with cracks and fissures. Leaves 3-6 by 1-2 in., oblong- or ovate-lanceolate, acuminate, mucronate-serrate, tough and coriaceous, young pinkish and woolly all over, mature dark-green and glabrous above, densely white- or grey- rarely brownish-tomentose beneath; lateral nerves 12-20 pairs, straight, parallel; base acute; petiole 5-7 in. long. Male spikes slender, drooping, 2-4 in. long, often much interrupted; perianth 4-5-lobed; anthers glabrous. Fem. fls. axillary, sessile, solitary or clustered, on current year's shoots; styles linear-clavate, spreading. Acorn generally solitary, usually on current year's shoots; cup at first enclosing the nut, glabrate, rough, woody; nut 8 in. long, conico-ovoid, canescent, brown when ripe.

OUTER HIMALAYA, JAUNSAAR and TEHRI-GARHWAL, between 4,000 and 8,000 ft., generally gregarious and associated with *Burāns* and *Aiyār*. Also in the Mothronwāla swamp in the Dūn, 1,900 ft.

Heartwood reddish-brown, very hard, warps and splits in seasoning. Annual rings indistinct. Medullary rays of two kinds; a few very broad rays with numerous fine ones between. Weight 64 lbs. per c. ft. The wood is used locally for building and for ploughs, and is a good fuel. The acorns are greedily eaten by bears, monkeys and squirrels, which is a drawback to its reproduction by seed. It coppices well up to about 9 in. diam.

New leaves and fl. Apr., May. Fr. Aug.-Oct.,—15-17 (or 3-5?) months after flowering, but remains on the tree throughout the cold weather.

4. *Q. glauca*, Thunb.; Fl. Br. Ind. v. 604. Syn.—*Q. annulata*, Sm.; Brandis For. Flora 487; Gamble Man. Ind. Timb. 387. Vern. *Indā*, *Bāni*, Jaunsar; *Phandāt*, Garhwal.



74. CUPULIFERÆ.

[*Quercus*.]

A large evergreen tree; bark grey, smooth up to pole stage, afterwards fissured and rough. *Leaves* 3-6 in. long, oblong or ovate-lanceolate, acuminate, cuspidate-serrate except near the base, coriaceous, glabrous and shining above, grey-pubescent when young, afterwards glaucous beneath; lateral nerves 12-14 pairs, straight, parallel; base acute; petiole .5-1 in. long. *Male spikes* hairy, very slender, drooping, bracts lanceolate, hairy, much longer than the flowers; *perianth-segments* 5, lanceolate. *Female fls.* sessile, 2-3 together on stout axillary peduncles, on the current year's shoots. *Cup* .5-.7 in. diam., of several thin velvety belts of connate scales, sessile on last year's shoots; nut .6-.7 in. long, sub-globose or ovoid, half-buried in the cup.

Shady valleys in JAUNSAK and TEHRI-GARHWAL, 3,500 ft., not conspicuously gregarious, often associated with Laurels and other evergreen trees. Abundant in the Lúnágádh and Mantárgádh valleys and their tributaries. Successfully cultivated in DEHRA.

The wood is grey or greyish-brown, tough and very hard, handsomely mottled, takes a good polish, but warps and cracks in seasoning. Medullary rays in broad irregular plates. Weight 60 lbs. per c. ft. It is used for much the same purposes as *Q. dilatata*, notably for soles of sledges in the Tehri-Garhwal leased forests.

Fl. Mar.-June. Fr. Aug.-Oct., 15-17 months after flowering.

Q. serrata, Thunb.; Fl. Br. Ind. v. 601;—is a deciduous Oak of the N.-E. HIMALAYA and KHASIA HILLS which has been successfully cultivated at DEHRA DÚN. *Leaves* oblong-lanceolate, spinous-toothed, generally with tufts of hairs in the nerve-axils. *Fruiting bracts* imbricate, free, recurved, woody; nut at last half-exserted. Wood brown, compact, very hard, closely resembling that of the English oak. It is used in Assam for building and various other purposes.

ORDER 75. SALICINEÆ; G. P. N. 160.

Deciduous trees or shrubs, generally fast-grown and soft-wooded. *Leaves* alternate, simple, stipulate; buds enclosed in scales. *Flowers* dioecious, both male and female in lateral catkins, each in the axil of a bract; bracteoles and perianth none. *Stamens* 2 or more, generally free, on a variously-shaped glandular disk. *Ovary* sessile or stipitate, 1-celled; style short or 0; ovules erect, anatropous, generally on 2-4 parietal or basal placentas. *Fruit* a 2-4-valved capsule; seeds few or many, each with a tuft of long silky hairs.



75. SALICINÆ.

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The Plants of this Family can be easily propagated by cuttings, and being also fast-growing, might be useful in quickly filling up blanks.

Analysis of the Genera.

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|--|-------------|
| Lvs. short-petiolate; stamens generally 2; fr. | |
| 2-valved. | 1. SALIX. |
| Lvs. long-petiolate; stamens 4 or more; fr. | |
| 2-4-valved. | 2. POPULUS. |

1. *Salix*, Linn.; G. P. n. 1.

The Willows.

Trees or shrubs. *Leaves* ovate to narrow-lanceolate, short-petioled; stipules deciduous, larger and more persistent on luxuriant young shoots. *Catkins* usually on leaf-bearing peduncles. *Bracts* entire. *Disk* of 1-2 glands. *Stamens* generally 2, long-exserted; filaments usually free. *Stigma* 2-fid or lobed, rarely entire. *Capsules* conical or narrow-lanceolate, 2-valved, with placentas near the base of the valves.

Analysis of the Species.

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|--|----------------------------|
| Stamens 4 or more; flowers after the leaves. | |
| Leaves broadly lanceolate; capsules long-stipitate | 1. <i>S. tetrasperma</i> . |
| Leaves linear-lanceolate; capsules shortly stipitate | 2. <i>S. aemophylla</i> . |
| Stamens 2. | |
| Flowers with or after the leaves; peduncles long. | |
| A large tree; leaves long, linear-lanceolate. | 3. <i>S. alba</i> . |
| A shrub; leaves short, elliptic or oblong | 4. <i>S. elegans</i> . |
| Flowers before the leaves; peduncles short. | |
| Leaves usually entire; style short | 5. <i>S. Wallichiana</i> . |
| Leaves always serrate; style long | 6. <i>S. daphnoides</i> . |

1. ***S. tetrasperma***, Roxb.; Fl. Br. Ind. v. 626; Brandis For. Flora 462; Gamble Man. Ind. Timb. 375. Vern. *Bed*, Jalmálá, Dún; *Lailá*, *Bhainsh*, Hind.

A moderate-sized tree; branchlets often tomentose; bark greyish-brown or blackish, rough with deep vertical furrows. *Leaves* 3-6 in. long, oblong or ovate-lanceolate, finely serrulate, rarely entire, glabrescent, glaucous beneath; lateral nerves numerous, prominent;



petiole 3-1 in. long; stipules ovate or orbicular. *Flowers* after the leaves, on leaf-bearing peduncles. *Male catkins* 2-4 in.; *female* 3-5 in. long. *Stamens* 5-10, free; anthers minute. *Stigmas* 2, subsessile, entire. *Capsules* 1-15 in. long, ovoid, on slender stipes of nearly the same length, in groups of 3-4, glabrous or puberulous; seeds 4-6.

Common on river-banks and moist or water-logged places in the DÚN and SAHÁRANPUR DIVISIONS, and also up to 6,000 ft. in JAUNSAIR and TEHRI-GARHWAL.

Heartwood red, soft, porous; annual rings not very distinct; weight about 33 lbs. per c. ft. It is used for gunpowder charcoal, and for posts and planks in Assam. The leaves are lopped for cattle-fodder, and the twigs are made into baskets.

New leaves Feb.-Mar. Fl. generally Feb.-Apr., less frequently in autumn. Fr. two months after flowering.

2. **S. acmophylla**, Boiss.; Fl. Br. Ind. v. 628; Brandis For. Flora 463. Vern. *Bed, Bádá, Jalmálá*, Dún.

A middle-sized handsome tree with flexuose branches which break off easily from the stem; bark reddish-brown. *Leaves* 2-8 by 3-7 in., those near the catkins much smaller, linear-lanceolate, upper caudate-acuminate, typically quite entire, but glandular-serrulate in a local form, glabrate or with adpressed hairs when young, glabrous and glaucous beneath when mature; lateral nerves faint; petiole 3-5 in. *Flowers* after the leaves on leafy peduncles. *Male catkins* 1-2 in.; *female* 1 in. long, both nodding. *Bracts* long, hairy. *Stamens* 4-6 (always 6 in the local form above alluded to); anthers short, circular. *Stigmas* 2, sessile, entire, spreading. *Capsules* shortly stipitate, ovoid-oblong, glabrous.

SAHÁRANPUR-SIWALIKS and DEHRA DÚN; rather rare. Cultivated throughout N.-W. India for ornament, and very extensively in Baluchistan as a fodder-tree.: Sháhjahánpur Ráu, Mohand Pass, Dúdhli, Khairi, etc.

Wood apparently of no great value. The leaves are lopped for fodder.

Fl. Feb., Mar. Fr. May, June.

The local form with reddish fragile branches, glandular-serrulate leaves, and 6-stamened flowers will probably be recognized as a distinct variety, if not a species.

3. **S. alba**, Linn.; Fl. Br. Ind. v. 629; Brandis For. Flora 466; Gamble Man. Ind. Timb. 375.

A fairly large tree; branchlets green, yellow, red or purple. *Leaves* 2-6 by 5-1 in., narrow-lanceolate, very gradually acuminate, glandular-denticulate, silky on both surfaces when young, dull-green above and white with adpressed silky hairs beneath when mature;



lateral nerves numerous, fine; petiole 2·5 in.; stipules silky. *Flowers* after the leaves; peduncle leafy. *Male catkins* 1·1·5 in. long, compact, cylindrical, drooping; *female* 2·3 in. long, lax, hairy. *Bracts* yellow or brown. *Stamens* 2. *Style* very short, 2-fid; stigmas 2-fid. *Capsules* subsessile, ovoid, glabrous or pubescent.

JAUNSAAR and TEHRI-GARHWAL, in the Tons, Jumna and Ganges valleys, ascending to 6,000 ft.; not very common, probably only cultivated. Abundant in SIMLA HILL STATES.

The wood is white near the circumference changing to pink or brown towards the centre; pores and medullary rays very fine, numerous and uniformly distributed; annual rings distinct. Weight about 30 lbs. per c. ft. This is the only wood which has so far been found fit for cricket-bats, and the demand for it has increased in the Punjab to such an extent of late years, that it is likely to be profitable to make plantations of it there.

Fl. Apr.

Allied to this is *S. babylonica*, Linn.; Fl. Br. Ind. v. 629;—the Weeping Willow, which is cultivated as an ornamental plant in gardens and cemeteries throughout India. Its long, slender, pendulous branches are quite characteristic. The leaves resemble those of *S. alba* in shape and size, but are not so white beneath.

4. *S. elegans*, Wall.; Fl. Br. Ind. v. 630; Brandis For. Flora 466; Gamble Man. Ind. Timb. 377. Vern. *Chhoti Bāshroi*, Jaunsar; *Kadvi*, Garhwal.

A middle-sized shrub; branches dark-green, drying black; young parts often grey-pubescent. *Leaves* 1·3 in. long, elliptic, obovate or oblong, obtuse or rounded, rarely acute at the tip, serrulate or subentire, hairy along the midrib, otherwise glabrous above, glaucous beneath, subcoriaceous when mature; lateral nerves indistinct; petiole 1·2 in. long. *Flowers* after the leaves on leaf-bearing peduncles. *Male catkins* 1·5 in.; *fem.* 3·5 in. long. Quite exceptionally some plants are not only monœcious, but bear male and female flowers on the same catkins, the latter occupying the upper half. *Bracts* yellow, pubescent. *Stamens* 2; anthers elliptic. *Stigmas* 2, subsessile, 2-partite. *Capsules* conical, under 1 in. in length, but in some forms up to 2 in., shortly stipitate, glabrous. "The leaves of this and *S. daphnoides* are often attacked by a brilliant orange-coloured fungus, which is *Lecythea salicina*, Lev."—Mr. J. S. Gamble.

An extremely common gregarious shrub in JAUNSAAR and TEHRI-GARHWAL, 7, 10,000 ft., generally associated with brambles and roses.

Wood pinkish; annual rings distinct; weight 33 lbs. per c. ft. Chiefly used as fuel. The leaves are used as fodder for cattle and goats.

Fl. Mar., Apr. Fr. May, June.



5. **S. Wallichiana**, Anders.; Fl. Br. Ind. v. 628; Brandis For. Flora 468; Gamble Man. Ind. Timb. 376. Vern. *Bhainshrá*, Jaunsar.

A small tree; young parts silky; bark greenish-grey. *Leaves* 2-5 in. long, oblong or ovate-lanceolate, acuminate, usually quite entire, silvery-tomentose on both surfaces; lateral nerves numerous, not very distinct; petioles 1-3 in. long. *Flowers* before the leaves; peduncles very short, generally with 1-3 rudimentary leaves at the base. *Male catkins* erect, 1-1.5 in. long; *female* 3-4 in. long, drooping; rachis tomentose. *Bracts* black. *Stamens* 2; anthers elliptic-oblong. *Stigmas* 2, erect, subsessile. *Capsules* downy, slender, short-stipitate.

JAUNSAAR and TEHRI-GARHWAL, ascending to 9,000 ft., but common between 7,000 and 8,000 ft.

Wood white or pinkish-white; weight 32 lbs. per c. ft. The branches are made into baskets, and the twigs are used as tooth-brushes.

Fl. Mar., Apr.

6. **S. daphnoides**, Villars; Fl. Br. Ind. v. 631; Brandis For. Flora 469; Gamble Man. Ind. Timb. 377. Vern. *Báshroi*, *Bhainshrá*, Jaunsar.

A small tree; branches dark-green or black, shining or with a glaucous bloom; bark smooth, greenish-grey. *Leaves* 3-5 in. long, elliptic-lanceolate (narrower in higher elevations), acuminate, serrate, glabrous above, glaucous beneath; lateral nerves numerous, prominent, silky beneath; petiole 1-4 in., pubescent or downy; stipules lanceolate. *Flowers* before the leaves; peduncle very short, with or without a few rudimentary leaves. *Male catkins* 1-2 in., erect; *female* 2-4 in., nodding or pendulous, both densely silky. *Bracts* black-tipped, villous. *Stamens* 2; anthers oblong, yellow. *Style* filiform; stigmas diverging, entire. *Capsules* subsessile, glabrous.

JAUNSAAR and TEHRI-GARHWAL, 2,500 to 15,000 ft. Fairly common about Deobán, Konáin and Kathián.

Heartwood red, shining; annual rings distinct; weight about 34 lbs. per c. ft. In the arid tracts of the Himalaya the wood is used for building, and for pails, tubs and similar purposes. The twigs are made into baskets, and are used for wattle-and-daub walls. The leaves and twigs, and even the bark of branches, are used for cattle-fodder.

Fl. Mar., Apr. Fr. May, June.

S. flabellaris, Anders. and *S. Lindleyana*, Wall.; Fl. Br. Ind. v. 634, may be mentioned as examples of dwarf willows, similar in habit to *Cotoneaster microphylla*, Wall. *Leaves* and *catkins* up to 1 in. in length. *Capsules* ovoid, red, glabrous. Such willows are



characteristic of high arctic or alpine climates and are found about the heads of the Ganges, Jumná and Tons rivers, 11, 15,000 ft., e.g., Harki Dún.

2. *Populus*, Linn.; *G. P. n. 2.*

1. *P. ciliata*, Wall.; Fl. Br. Ind. v. 638; Brandis For. Flora 475; Gamble Man. Ind. Timb. 379. The Himalayan Poplar. Vern. *Piplás* (corruption of Poplar), *Bídon*, *Sharphára*, *Tildunju*, *Kapási*, Jaunsar; *Pahári Pipal*, Hind.

A lofty tree; bark grey, smooth on young plants, with vertical wrinkles or fissures on old stems; buds viscid, lanceolate. *Leaves* 3-7 by 2.5-5 in., broad-ovate, acuminate, finely dentate, margins gland-ciliate, otherwise quite glabrous; base usually cordate, 3-5-nerved; lateral nerves 4-6 pairs above the basal, irregularly forked; petiole 2-5 in. long, compressed above. *Flowers* before the leaves, in lateral catkins. *Male catkins* 2-4 in. long, somewhat interrupted; *female* 6-9 in. long, lax in fruit. *Disk* toothed, embracing half the ovary. *Bracts* 3 in. long, early caducous. *Stamens* indefinite; filaments short, very slender. *Stigmas* 3-4, obcordate, subsessile. *Capsules* 3-5 in. long, ovoid, 3-4-valved; stipes and hairs of the seeds as long as the capsules.

JAUNSAAR and TIBETI-GARHWAL, 4, 10,000 ft.; sometimes cultivated. Affects sunny banks with a light soil. Male trees are very scarce.

Wood white or brownish-grey, shining, soft; annual rings distinct. Medullary rays very fine, very numerous. Weight about 30 lbs per c. ft. The wood is used for water-troughs, and the leaves are valued as fodder for goats.

Leafless Oct.-Feb. Fl. Mar., Apr.; the males much earlier than the females. Fr. May, June.



CSL

GYMNOSPERMS.

ORDER 76. GNETACEÆ; G. P. N. 164.

TREES or shrubs; branches articulated; wood without pores. *Leaves* opposite, large or quite rudimentary, exstipulate. *Flowers* monœcious or diœcious, in axillary or terminal spikes or cones. MALE FL. tubular or of 2-4 sepals; *anthers* 2-8, on a column of the connate filaments. FEMALE FL. a naked erect ovule with several coats, one of which is produced into a style-like tube; *stigma* 0. *Fruit* dry or succulent, enclosed in the persistent bracts; seeds 1 or 2; cotyledons 2.

1. *Ephedra*, Linn.: *Sl. R.* n. 2.

1. *E. vulgaris*, Rich.; *Fl. Br. Ind.* v. 640; Brandis *For. Flora* 501; Gamble *Man. Ind. Tib.* 394. Vern. *Tūt-ganthā*, Jaunsar.

A small shrub; branches opposite or whorled, green, striate; nodes 1-2 in. long; bark on old stems grey. *Leaves* scale-like; scales connate into a 2-lobed sheath, yellow or brown. *Spikes* 1-3 in. long, often in whorled clusters; fruiting spikes red, often succulent. *Fruit* 3 in. long, ovoid, red and sweet when ripe; seeds 2.

Dry southern exposure of the Deoban ridge, JAUNSAAR, 8,000 to 9,500 ft., e.g., Gidi Khad, below Karamba Peak, etc.

Wood yellowish-white, very close-grained, without pores. Goats browse on the branches, and the fruit is eaten in some places.

Fl. Apr.-June. Fr. Aug.-Oct.

ORDER 77. CONIFERÆ; G. P. N. 165.

Trees or shrubs, generally evergreen; wood without pores on a cross section; annual rings very distinct. *Leaves* alternate, or in alternate fascicles, rigid, generally acicular, exceptionally scale-like or linear, exstipulate.

Flowers monœcious or dicecious; *perianth* none. **MALE** FLS. in deciduous catkins; *anthers* 1- or more-celled, adnate to the scales of the catkin, or on a column of connate filaments. **FEMALE** FLS. of 1, 2, or more naked ovules on a carpellary scale, which is free or adnate to the scales of a spike, the whole becoming a cone in fruit; *stigma* none. *Seeds* usually winged; cotyledons generally more than two.

Analysis of the Genera.

- | | |
|---|---------------|
| Female cone with only 1 flower; scales imbricate, basifixed; leaves linear, not adpressed | 3. TAXUS. |
| Female cone few-flowered, scales decussately opposite, peltate; leaves scale-like or subulate, adpressed. | |
| Scales woody, separating in mature fruit; seeds winged | 1. CUPRESSUS. |
| Scales succulent, connate in mature fruit; seeds not winged | 2. JUNIPERUS. |
| Female cone many-flowered, scales imbricate, basifixed; leaves (generally known as <i>needles</i>) not adpressed | |
| Leaves fascicled. | |
| Lvs. long, in fascicles of 2-5. | 4. PINUS. |
| Lvs. short, (mostly) in fascicles of many | 5. CEDRUS. |
| Leaves distinct. | |
| Leaves acicular, multifarious | 6. PICEA. |
| Leaves flat, bifarious | 7. ABIES. |

1. *Cupressus*, Linn.; G. P. n. 6.

1. *C. torulosa*, Don; Fl. Br. Ind. v. 645; Brandis For. Flora 533; Gamble Man. Ind. Timb. 410. The Himalayan Cypress. Vern. *Leuri*, *Leauri*, Jaunsar; *Devidiar*, *Devidwar*, carpenters of Dún and Sahāranpur.

A large* evergreen tree with a pyramidal crown and drooping branchlets; bark greyish-brown, peeling off in long thin strips.

* There is a tree near the Temple at Deota, THURI-GARHWAL, 9,000 ft., which measured 22 ft. in girth and 154 ft. in height in May 1896.



Leaves opposite, amplexicaul, scale-like, .05 in. long, triangular, more or less closely adpressed, with a gland on either side of the midrib. *Male catkins* terminal, cylindrical, with decussately opposite peltate scales each with 2-6 anther-cells near the edge. *Female fl.* a globose cone consisting of 6-10 decussately-opposite peltate scales, the middle scales bearing 4-6 erect ovules at the base. *Mature cone* .5 in. diameter, bluish; scales rugose, separating in drying into hexagons. *Seeds* compressed, with an orbicular wing, .2 in. diam. including the wing; cotyledons 2-3.

JAUNSAAR and TEHRI-GARHWAL, 6,000 ft., generally on limestone formations, often crowning rugged limestone precipices. Abundant on N.-E. aspects between the Lakāndi and Moilā Peaks, JAUNSAAR.

Heartwood light-brown with darker streaks, moderately hard; medullary rays fine, numerous; weight 39 lbs. per c. ft. It is used at Nāini Tā. for building, and is an excellent timber for sleepers, experiments carried out at the Forest School having proved it to be even more durable than Deodar. It is burnt as an incense in temples.

Fl Jan., Feb. Fr. Oct., Nov. but remains long on the tree.

C. sempervirens, Linn., is an ornamental tree cultivated in gardens throughout India, which differs from *C. torulosa* by having a cylindrical crown and branches with erect tips, and a larger cone with tubercled scales.

2. *Juniperus*, Linn.; G. P. n. 7.

The Junipers.

1. ***J. recurva***, Ham., var. *squamata*, Parlat.; Fl. Br. Ind. v. 647; Brandis For. Flora 536; Gamble Man. Ind. Timb. 412 The Weeping Blue Juniper. Vern. *Gúggāl*, N.-W. P.

A bushy prostrate shrub. *Leaves* in whorls of 3, 15-2 in. long, linear, pungent, somewhat narrowed at the base, flat and bluish-green above, convex and light-green beneath, often incurved. *Catkins* at the ends of short lateral branches; the *male* ovoid, yellow; the *female* small; ovules erect. *Fruit* an oblong berry, .3-5 in. diam., with the tips of the scales protruding at the apex, the rest cohering into one mass, dark-purple, smooth, shining when ripe. *Seed* solitary, oblong, not winged.

TEHRI-GARHWAL, from 12,000 ft. upwards: Chānsil, Gangotari, etc. On the Chur mountain SIMLA HILL STATES.

Sapwood white; heartwood light-red, very fragrant; weight 40 lbs. per c. ft. It is chiefly used for fuel and burnt as an incense.

Fl. June, July. Fr. Aug.-Oct. of the second year.

2. J. macropoda, Boiss. ; Fl. Br. Ind. v. 647. Syn — *J. excelsa*, M. Bieb. ; Brandis For. Flora 538 ; Gamble Man. Ind. Timb. 412. Vern. *Dhúp*, N. W. P.

A moderate-sized tree with thin reddish-brown fibrous bark ; trunk generally gnarled ; branchlets slender. *Leaves* of two kinds,— of the lower branches up to 3 in. long, subulate, pungent,— of the upper scale-like and closely adpressed (resembling those of *Cupressus torulosa*), ovate, acute, with a large dorsal gland,—all of a light-green colour. *Male catkins* terminal, on a scaly peduncle. *Berry* 2·3 in. diam., subglobose, glaucous, black when ripe, very resinous ; tips of the scales forming transverse ridges ; seeds 2-5.

TEHRI-GARHWAL along the Jádangá, a tributary of the Bhágirathi (Pt. Keshavánand).

Sapwood large, white ; heartwood dark-red, even- and close-grained, with a scent similar to that of the pencil-cedar ; weight about 32 lbs. per c. ft. It is used for fuel and occasionally burnt for incense.]*

3. *Taxus*, Tourn. ; G. P. n. 13.

1. T. baccata, Linn. ; Fl. Br. Ind. v. 648 ; Brandis For. Flora 539 ; Gamble Man. Ind. Timb. 413. The Yew. Vern. *Thúner*, *Thúniára*, Jaunsar.

An evergreen tree, generally middle-sized, but sometimes very large, with a large spreading crown ; bark reddish-grey, thin, smooth, peeling off in longitudinal shreds. *Leaves* distichous, 1-1·5 by 1 in., linear, often cuspidate-acuminate, dark-green and shining above, brownish-yellow and somewhat mealy beneath, 1-nerved, narrowed into a short petiole. *Flowers* usually diœcious, axillary. *Male fl.* a pedicelled whorl of 3-8 anther-cells on peltate scales. *Female fl.* a single erect ovule surrounded by a disk, at the apex of a scaly peduncle. *Fruit* an ovoid berry, 3·4 in. long, the disk developing into a fleshy covering, which overtops and nearly conceals the compressed wingless olive-green seed ; cotyledons 2.

JAUNSAAR and TEHRI-GARHWAL, 6-10,000 ft., generally in shady ravines ; common, but not abundant : Jádi Block, Deoban ; Tútuá Block, Mundáli ; Lambátách ; Rikhsin, etc.

Sapwood white ; heartwood orange-red, close-grained, hard, smooth, elastic, works and polishes extremely well, but somewhat slow to season. Annual rings wavy. Medullary rays extremely fine, very numerous. Weight 44 lbs. per c. ft. The wood is eminently fit for cabinet-work, and is used for bows, carrying-poles and furniture. The bark is used by Kunawaris as a substitute for tea, this accounting for the long blazes usually seen on road-side trees. The fruit is eaten.

Fl. Mar.-May. Fr. Sept.-Nov.

* This having being subsequently added, the Genus could not be separately described or analysed.



Leaves opposite, amplexicaul, scale-like, .05 in. long, triangular, more or less closely adpressed, with a gland on either side of the midrib. *Male catkins* terminal, cylindrical, with decussately opposite peltate scales each with 2-6 anther-cells near the edge. *Female fl.* a globose cone consisting of 6-10 decussately-opposite peltate scales, the middle scales bearing 4-6 erect ovules at the base. *Mature cone* .5 in. diameter, bluish; scales rugose, separating in drying into hexagons. *Seeds* compressed, with an orbicular wing, .2 in. diam. including the wing; cotyledons 2-3.

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Heartwood light-brown with darker streaks, moderately hard; medullary rays fine, numerous; weight 39 lbs. per c. ft. It is used at Nāini Tā. for building, and is an excellent timber for sleepers, experiments carried out at the Forest School having proved it to be even more durable than Deodar. It is burnt as an incense in temples.

Fl Jan., Feb. Fr. Oct., Nov. but remains long on the tree.

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A bushy prostrate shrub. *Leaves* in whorls of 3, .15-.2 in. long, linear, pungent, somewhat narrowed at the base, flat and bluish-green above, convex and light-green beneath, often incurved. *Catkins* at the ends of short lateral branches; the *male* ovoid, yellow; the *female* small; ovules erect. *Fruit* an oblong berry, .3-.5 in. diam., with the tips of the scales protruding at the apex, the rest cohering into one mass, dark-purple, smooth, shining when ripe. *Seed* solitary, oblong, not winged.

TEHRI-GARHWAL, from 12,000 ft. upwards.: Chānsil, Gangot-tari, etc. On the Chur mountain SIMLA HILL STATES.

Sapwood white; heartwood light-red, very fragrant; weight 40 lbs. per c. ft. It is chiefly used for fuel and burnt as an incense.

Fl. June, July. Fr. Aug.-Oct. of the second year.

5. **J. macropoda**, Boiss. ; Fl. Br. Ind. v. 647. Syn — *J. excelsa*, M. Bieb. ; Brandis For. Flora 538 ; Gamble Man. Ind. Timb. 412. Vern. *Dhúp*, N. W. P.

A moderate-sized tree with thin reddish-brown fibrous bark ; trunk generally gnarled ; branchlets slender. *Leaves* of two kinds, — of the lower branches up to 3 in. long, subulate, pungent, — of the upper scale-like and closely adpressed (resembling those of *Cupressus torulosa*), ovate, acute, with a large dorsal gland, — all of a light-green colour. *Male catkins* terminal on a scaly peduncle. *Berry* 2·3 in. diam., subglobose, glaucous, black when ripe, very resinous ; tips of the scales forming transverse ridges ; seeds 2-5.

TEHRI-GARHWAL along the Jádgangá, a tributary of the Bhágirathi (Pt. Keshavánand).

Sapwood large, white ; heartwood dark-red, even- and close-grained, with a scent similar to that of the pencil-cedar ; weight about 32 lbs. per c. ft. It is used for fuel and occasionally burnt for incense.]*

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An evergreen tree, generally middle-sized, but sometimes very large, with a large spreading crown ; bark reddish-grey, thin, smooth, peeling off in longitudinal shreds. *Leaves* distichous, 1-1·5 by 1 in., linear, often cuspidate-acuminate, dark-green and shining above, brownish-yellow and somewhat mealy beneath, 1-nerved, narrowed into a short petiole. *Flowers* usually dioecious, axillary. *Male fl.* a pedicelled whorl of 3-8 anther-cells on peltate scales. *Female fl.* a single erect ovule surrounded by a disk, at the apex of a scaly peduncle. *Fruit* an ovoid berry, 3·4 in. long, the disk developing into a fleshy covering, which overtops and nearly conceals the compressed wingless olive-green seed ; cotyledons 2.

JAUNSAAR and TEHRI-GARHWAL, 6, -10,000 ft., generally in shady ravines ; common, but not abundant : Jádi Block, Deoban ; Tútúá Block, Mundáli ; Lambátách ; Rikhsin, etc.

Sapwood white ; heartwood orange-red, close-grained, hard, smooth, elastic, works and polishes extremely well, but somewhat slow to season. Annual rings wavy. Medullary rays extremely fine, very numerous. Weight 44 lbs. per c. ft. The wood is eminently fit for cabinet-work, and is used for bows, carrying-poles and furniture. The bark is used by Kunawaris as a substitute for tea, this accounting for the long blazes usually seen on road-side trees. The fruit is eaten.

Fl. Mar.-May. Fr. Sept.-Nov.

* This having being subsequently added, the Genus could not be separately described or analysed.

4. *Pinus*, Linn.; G. P. n. 26

Evergreen trees; branches whorled and generally horizontal. *Leaves* of two kinds: on seedlings and luxuriant shoots single and short; on older shoots and trees in bundles of 2-5 and usually long, the latter at first from the axils of the former. *Male catkins* crowded at the base of the current year's shoots. *Anther-cells* in pairs, on a short column, connected at the back by a scale-like connective, which is produced at the tip; several such pairs imbricately close-packed in each catkin. *Female cones* globose or ovoid, generally at the end of the current year's shoots; scales spirally imbricate, open at first, but closing after fertilization; ovules 2 at the axil of each scale, inverted. *Ripe cones* ovoid, oblong or cylindrical, usually at the base of the current year's shoots; scales thickened and woody, beaked or with a square knob at the apex. *Seeds* with a hard woody shell, in pairs at the base of each scale, oily, generally winged; cotyledons usually more than two.

Analysis of the Species.

Leaves in clusters of 5, bluish-green; cone cylindrical, with scales not much thickened at the apex.

1. *P. excelsa*.

Leaves in clusters of 3, light-green; cone ovoid, with scales much thickened at the apex.

2. *P. longifolia*

1. *P. excelsa*, Wall.; Fl. Br. Ind. v. 661; Brandis For. Flora 510; Gamble Man. Ind. Timb. 398. The Blue Pine. Vern. *Kāil*, Hind.; *Chil*, Jaunsar.

A large tree; bark smooth slate-coloured and leathery on young trees, grey or greyish-brown, corky and with shallow fissures on mature trees. *Leaves* in bundles of 5, 6-8 in. long, slender, triquetrous, glaucous on the inner faces (giving the foliage its characteristic bluish colour); sheaths entire, deciduous. *Male catkins* 3 in. long, ovoid or oblong. *Cones* generally 2-3 together, 6-12 in. long when ripe, on peduncles 1-3 in. long, cylindrical, erect before fertilization, afterwards pendulous; scales 2-2.5 in. long, 1-1.5 in. broad near the end, spatulate; end not much thickened, rhomboid



at the back. *Seeds* blackish, ovoid, acute at both ends, compressed, 25-35 in. long; wing about three times as long, obliquely truncate; cotyledons usually 9.

JAUNSAE and TEHRI-GARHWAL, 6-10,000 ft., generally as a companion of Deodar, for which species, if properly guarded against, it is an excellent nurse in early life. In JAUNSAE it is seldom gregarious above 8,500 ft. Occasionally as low down as 4,000 ft., e.g., in the Giri valley, SIMLA HILLS.

Heartwood pinkish-brown, moderately hard; annual rings distinct, marked by a line of compact wood at the outer edge; medullary rays very fine and very numerous; resin ducts smaller than those of *P. longifolia*; weight 30 lbs. per c. ft. The wood is more durable than that of chir, and is altogether a much better timber, but is seldom used beyond the hills, the plains people being doubtful of its qualities, probably from its lighter weight. The sapwood gives a resin, which, though smaller in yield per individual tree, is much superior in quality to that of *P. longifolia*. The wood of the stumps is used for torches, and tar and pitch can be extracted from it by destructive distillation. The leaves may be used to stuff cushions. In certain years a sweet liquid, commonly known as honey-dew, is secreted by some Aphidæ which infest the leaves of the pines and occasionally of other Coniferous trees. This sweet substance is collected and eaten by the inhabitants of the Himalaya. The bark of poles is used for roofing temporary huts. The seeds are sometimes eaten, but they are too resinous to be much relished.

Fl. Apr.-June. Fr. Ripens Sept.-Nov. of the second year.

2. *P. longifolia*, Roxb.; Fl. Br. Ind. v. 652; Brandis For. Flora 506; Gamble Man. Ind. Timb. 396. The Long-leaved Pine. Vern. *Chir*, Hind.; *Sarol*, Sirli, *Kulhdin*, Garhwal and Jaunsar.

A large light-loving tree with a clear straight bole; bark 1-2 in. thick, outer corky and in thin crisp plates, reddish-brown, -inner brick-red, vertically and spirally furrowed; branches rough, soon corky. *Leaves* in bundles of 3, 9-12 in. long, obscurely triquetrous, light-green; sheath greyish-brown, persistent, fimbriate. *Male catkins* 3-6 in. long, ovoid-cylindric. *Cones* solitary or 3-5 together, 4-8 by 3-5 in. near the base, ovoid, on short stout stalks; scales 1-2 by 7 in., beak 4-6-gonous, reflexed, much thickened, generally with a sharp black tip. *Seeds* 3-45 in. long, obliquely oblanceolate, compressed, with a membranous wing, which is rather longer than the seed; cotyledons about 12.

Throughout the SCHOOL CIRCLE, between 2,000 and 6,500 ft.; generally gregarious, often forming extensive pure forests. SAHARANPUR SIWALKES, 2-3,000 ft.; Ládauköt in the MALKÖT HILLS, 4-6,000 ft.; Tons and other valleys in JAUNSAE and TEHRI-GARHWAL, 3-6,500 ft.



77. CONIFERÆ.

[Pinus.]

The heartwood is soft, reddish; annual rings well-marked by a compact darker-coloured belt at the outer edge, inner zone spongy; medullary rays fine, numerous; resin-ducts prominent on a vertical section; weight about 41 lbs. per c. ft. The wood is not durable, specially when exposed to wet. It is, however, used in the hills, and is rising in the estimation of the plains people of the Punjab, where it is largely exported for building and other purposes. The sapwood yields large quantities of resin, from which turpentine and rosin are manufactured. The charcoal of the bark is much prized by Jaunsari blacksmiths. The seeds are eaten by the hill-people. Other economic uses are similar to those of Káil, excepting that the bark is never used for roofing.

• Fl. Feb.-April. Seeds shed Oct., next year. The cones remain long on the tree.

The important article of food known throughout Northern India as *Chilgúzā* is the seed of a pine tree, *P. Gerardiana*, Wall.; Fl. Br. Ind. v. 652,—which is a native of AFGHANISTAN, KAPIRISTAN and ARID HIMALAYA. Seeds about .8 in. long, oblanceolate, terete.

5. *Cedrus*, Loud.; G. P. n. 27.

1. **C. Libani**, Barrel., var. *Deodara*, Hook. f.; Fl. Br. Ind. v. 653. Syn.—*Cedrus Deodara*, Loud.; Brandis For. Flora 516; Gamble Man. Ind. Timb. 400. The Himalayan Cedar. Vern. (*Devadárú*, Sans., whence) *Deodár*, *Dedwár*, *Dewár*, Hind.; *Kelon*, Jaunsar.

A very large and tall gregarious tree, probably the largest and longest-lived in India,* noted for its great beauty; branches and branchlets horizontal, tips slender and nodding; crown from pyramidal in early life to spherical when mature; bark greyish- or reddish-brown, with vertical and diagonal fissures. Leaves 1-1.5 in. long, acicular, triquetrous, glaucous-green, mostly in dense fascicles, with a few solitary ones, scattered between the fascicles. Male catkins solitary, at the ends of the branchlets, about .3 in. long, ovoid. Anthers as in *Pinus*. Ovules inverted, 2 at the base of each scale. Cones always erect, 4-5 in. long by 3-4 in. near the base, ovoid or pyramidal; scales fan-shaped, imbricate, transversely closely-packed in the cone so as to expose only the outer edges; margins thin. Seeds .35-.5 in. long, triangular or broadly crescent-shaped; wing triangular, .6-.7 in. long; cotyledons about 10.

Deodar is found in a distinct zone of its own, which in JAUNSAIR and TEHRI-GARHWAL is between 7,000 and 8,500 ft. In the lower

* There is a section in the Forest School Museum, 27 ft. in girth, the age of which is estimated to be about 900 years.



limit the Blue Pine, and elsewhere the Spruce Fir and the Mōru Oak are its constant companions.

Heartwood light yellowish-brown, fine- and even-grained, moderately hard, strongly scented. Annual rings very distinct, being marked at the outer edge by a fine line of darker colour. Medullary rays generally very fine but of unequal width; no visible resin ducts. Weight 35-40 lbs. per c. ft. Deodar is one of the three most important timber trees of India, the other two being Teak and Sāi. The wood is extremely durable, and is proof against whiteants, and to some extent against wet, on account of the oil which it contains. It is extensively used for building, is very much in demand for sleepers, and is the best wood for shingles in North-Western India. The oil is extracted from it by destructive distillation, and is used as a remedy for ulcers and eruptions, and also for rubbing on *Sarnāis* (inflated skins used for crossing rivers) to keep them from rotting. It is a bad fuel.

Male fl. Sept., Oct. The cones do not begin to grow until April; they ripen and shed seeds in Oct.,-Nov., i.e., about 13 months after flowering.

6. *Picea*, Link.; *G. P. n.* 28.

1. **P. Morinda**, Link.; Fl. Br. Ind. v. 653. Syn.—*Abies Smithiana*, Forbes; Brandis For. Flora 525; Gamble Man. Ind. Timb. 407. The Himalayan Spruce. Vern. *Roi*, *Rái*, Jaunsar.

A lofty tree,* with rough greyish-white bark, exfoliating in thin orbicular scales about 1 in. in diam.; branches horizontal; branchlets slender, pendulous. *Leaves* 1-1.5 in. long, 4-sided, acicular, stiff, scattered in multifarious spirals round the branchlets (which look somewhat like bottle-brushes). The bud-scales cohere to form a conical cap which falls off when the leaves open. *Male catkins* single, about .4 in. long, ovoid, in the axils of the leaves; anther-cells adnate to the stipitate scales. *Ovules* inverted, in pairs behind the carpellary scales, and in the axils of the imbricating scales of the spike which afterwards becomes the cone. *Cones* terminal, 4-6 in. long, 1.5-2 in. diam., cylindric, pendulous after fertilization, dark-brown when ripe; scales with a thin edge, smooth outside, concave, broadly obovate; base cuneate. *Seeds* about .15 in. long, obliquely oblong, dark-grey, with a broad spatulate obliquely-truncate wing which is about .5 in. long; cotyledons 8-10.

JAUNSAI and TEHRI-GARHWAL, 7, 11,000 ft., associated in Deodar forests with that species and Mōru Oak, and in higher elevations with Silver Fir and Kharshu Oak,—generally affecting sunny aspects.

* Trees 24 ft. in girth and 210 ft. in height have been measured near Mundāli, JAUNSAI, 8,800 ft.



77. CONIFERÆ.

Price.

Wood white with a brownish tinge, rather soft; medullary rays very fine and very numerous; resin-ducts scanty; weight 30 lbs. per c. ft. It is used for planks and packing-cases, and for shingles in the hills. It is an indifferent fuel, but the charcoal is fairly good. The bark is used for roofing huts, and to make water-troughs.

Fl. April. Cones ripen in Oct.-Nov.

7. *Abies*, Juss.; G. P. n. 31.

1. *A. Webbiana*, Lindl.; Fl. Br. Ind. v. 654; Brandis For. Flora 528; Gamble Man. Ind. Timb. 408. The Himalayan Silver Fir.

A lofty tree with a dense cylindrical crown, pre-eminently shade-enduring; branches pendulous, branchlets stout, stiff, spreading horizontally; bark smooth on young stems, dark-brown or grey and cut up into long and narrow scales on old trees. Leaves 1-2 by 1 in., flat, narrow-linear, narrowed into a short petiole, spirally arranged but declinate on two sides to appear distichous, glossy dark-green above with two faint white lines on either side of the midrib beneath; tip emarginate, generally with two sharp cusps; persistent for at least three years. Cones always erect, oblong or cylindrical, 2-4 in. long, 1.5-3 in. diam., dark-purple when ripe; scales closely imbricate, abovate; edge rounded, thin. Seeds 15-2 in. long, obovoid; wing twice as long, broadly obovate, truncate; cotyledons 5-6.

TEHRI-GARHWAL, 8,000-13,000 ft., generally in moist shady northern aspects and ravines.

Wood white, soft; medullary rays extremely fine and too weak to bind together the annual rings which often separate to form cupshakes. Weight 29 lbs. per c. ft. It is not very durable when exposed to wet, but seems to last well as shingles, and is used locally for construction in many parts of the Himalaya.

Fl. Apr. Cones ripen in Sept.-Oct.

Var. *Pindrow*, Brandis; Fl. Br. Ind. v. 655. Vern. *Morindá*, Jaunsar, - differs from the type by having longer leaves (2-3 in.), and more slender cylindrical cones (about 1.5 in. in diam.).

This lofty and graceful tree is common in JAUNSAAR and TEHRI-GARHWAL, 8-10,000 ft., generally on northerly aspects and in shady localities, and often attains an enormous size, trees 250 ft. high and 25 ft. in girth having been found at Mundáli. It is important in the Deoban Range as a fuel tree.

MONOCOTYLEDONS.

PETALOIDEÆ.

ORDER 78. SCITAMINEÆ ; G. P. N. 170.

HERBS, generally with a perennial rhizome and an unbranched stem. *Leaves* pinnately parallel-nerved from a stout midrib. *Flowers* irregular, usually 2-sexual, solitary or in spikes or panicles. *Calyx* superior, free, tubular or spathaceous. *Corolla* gamopetalous; limb 3-partite. *Stamens* usually only 1 fertile, the rest reduced to petaloid staminodes, rarely (in *Musa*) 5 fertile. *Ovary* 3-celled; ovules many, generally axile; style slender. *Fruit* a 3-valved capsule, sometimes indehiscent. *Seeds* often with an arillus.

This Family has great economic importance, but is not of much forest interest in the SCHOOL CIRCLE. The following are cultivated in this CIRCLE and are well-known throughout India:—

1. *Curcuma longa*, Linn.; Fl. Br. Ind. vi. 214. The Turmeric plant. Vern. *Haldi*, Hind.—Remarkable for its bright-yellow tubers which are used as a condiment throughout India. *Leaves* 1-1.5 ft. by 4-8 in.; petiole as long as the blade. Peduncle about 6 in. long. *Flowers* yellowish. It is much cultivated near Kálsi and Saíd.—G. P. n. 9.

2. *Zingiber officinale*, Rose.; Fl. Br. Ind. vi. 246. The Ginger plant. Vern. *Ádrak*, Hind.—Well-known for its aromatic rootstock which is used as a condiment and also in medicine. *Leaves* distichous, 6-12 by 1-1.5 in., dark-green. Much cultivated in the Dén and also above Kálsi.—G. P. n. 16.

3. *Musa sapientum*, Linn.; Fl. Br. Ind. vi. 262. The Banana or Plantain tree. Vern. *Kelá*, Hind.—This differs from the rest of the Family by having 5 perfect stamens, and unisexual flowers arranged in a drooping spike. *Leaves* 4-8 ft. long, glabrous above, usually with a white bloom beneath. Two or three varieties are cultivated in the Dén and OUTER HIMALAYA and also in the SAHÁRANPUR DISTRICT. A wild variety is found in ravines of the Nágsidh Hill and in the



Khairi swamp in the DŪN, Sahansra-dhārā and similar other ravines in the OUTER HIMALAYA, and in the Āmlāwa valley in JAUNSAH.
—G. P. n. 34.

4. *Costus speciosus*, Smith; Fl. Br. Ind. vi. 249;—is a common weed in Sāl forests in the DŪN, characterised by large white flowers, red bracts and bright-red capsules.—G. P. n. 178.

ORDER 79. LILIACEÆ; G. P. N. 178.

Herbs or small shrubs with creeping root-stocks, bulbs or corms. *Flowers* usually 2-sexual. *Perianth* coloured, often herbaceous; segments 6 or more in two series, usually imbricate in bud. *Stamens* 6, free or connate; anthers often versatile. *Ovary* 3-celled; ovules 1-2, axillary; style 1, often long. *Fruit* a 3-celled capsule, or a 1-or more-seeded berry; seeds globose or flattened.

This large Family is well known for flowers of great beauty, some of them exquisitely fragrant. Of useful cultivated plants, the Onion, *Allium Cepa*, Linn., Vern. *Piāz*, Hind.; and the Garlic, *Allium sativum*, Linn., Vern. *Lahsūn*, Hind., deserve mention. Fl. Br. Ind. vi. 337. Of forest Genera only the following two are briefly described.

Analysis of the Genera.

- | | |
|--|---------------|
| Leaves normal, 3-5-nerved; flowers in umbels | 1. SMILAX. |
| Leaves represented by cladodes; flowers solitary,
fascicled or racemed. | 2. ASPARAGUS. |

1. *Smilax*, Linn.; G. P. n. 2.

Generally climbing shrubs. *Leaves* usually alternate, 3-5-nerved, net-veined; petiole often with tendrils near the base. *Flowers* dioecious, umbelled. *Perianth-segments* 6, free. MALE FL.: *Stamens* 6, free, sometimes forked at the tip separating the anther-cells. FEM. FL.: *Staminodes* 3 or 6. *Style* 0 or very short; stigmas 3. *Fruit* a globose berry; seeds 1-3, generally 2; albumen horny.

1. *S. prolifera*, Roxb.; Fl. Br. Ind. vi. 312. Vern. *Ram-dataun*, Dún.

A stout climbing shrub with prickly stem, occasionally up to 1 in. in diameter. *Leaves* 4-8 by 2-6 in., oblong, ovate or orbicular, coriaceous; nerves 3-7 from above the rounded or sub-cordate base; *petiole* 5-15 in. long, often auricled at the base round the stem; *tendrils* 2-4 in. long. *Umbels* 30-40-fid; *peduncles* 7-15 in.; *pedicels* 5 in. *Sepals* 1 in., oblong-lanceolate. *Petals* as long, but narrower. *Stamens* 6, 1 in. long; *staminodes* of fem. fl. 3. *Ovary* oblong; *stigmas* deciduous. *Berries* round, red when ripe, 3 in. diam.

Common in the DÚN and SAHÁRANPUR DIVISIONS, especially in Sál forests. Also in the OUTER HIMALAYAS.

The stem has a strong fibrè which can be used for brushes. The thinner stems are used as tooth-sticks.

Fl. Aug., Sept. Fr. Dec.-Feb.

Several other species of *Smilax* are found in the SCHOOL CIRCLE, of which the following deserve mention :—

1. *S. parvifolia*, Wall.; Fl. Br. Ind. vi. 304.—A gregarious undershrub with stiff slender zigzag branches. *Leaves* very variable, 1-3 in. long, ovate or lanceolate, acuminate, membranous; *petiole* sheathing, 1 in. long, jointed at the top. *Peduncles* and *pedicels* very slender, 2-5 in. long. *Flowers* minute. *Berries* 3-5 in. diam. Common in JAUNSAAR and TEHRI-GARHWAL, up to 8,500 ft.

2. *S. vaginata*, Dene.; Fl. Br. Ind. vi. 305.—A plant very similar in appearance to the above, but the petioles are 3-7 in. long and jointed below the extremity, and the female flowers solitary. It is found in much the same localities as the above, only ascending somewhat higher, e.g., Deoban—9,000 ft.

3. *S. elegans*, Wall.; Fl. Br. Ind. vi. 305.—This is another plant of very much the same appearance as *S. parvifolia*, but distinguished by broader leaves, longer sheaths of the petioles, and much larger flowers (2-3 in. diam.). Common in JAUNSAAR.

4. *S. aspera*, Linn.; Fl. Br. Ind. vi. 306.—A large climbing shrub. *Leaves* 1-5-6 in. long, ovate, deltoid or lanceolate, with a hastate or cordate base; *petiole* 5-7 in. long, often prickly; *tendrils* 2-3 in. *Flowers* white, sweet-scented; buds oblanceolate, longer than the pedicels. *Berries* 2-3 in., bluish. OUTER HIMALAYA and low valleys in JAUNSAAR.

2. *Asparagus*, Linn.; G. P. n. 7.

Erect or straggling shrubs; rootstock generally terminating in a dense fascicle of spindle-shaped farinaceous roots. *Leaves* reduced to scales or spines, with tufts of green needle-like or flattened rudimentary branchlets (cladodes) in the axils, which are likely to be mistaken for the true leaves. *Flowers* axillary, solitary fascicled or racemed. *Perianth* 6-partite; stamens opposite the perianth-segments; style 1; stigmas 3. *Berry* globose.

Analysis of the Species.

Stem unarmed; cladodes flat; flowers not racemed. 1. *A. filicinus*.
Stem spinous; cladodes needle-like; flowers racemed. 2. *A. racemosus*.

1. ***A. filicinus***, Ham.; Fl. Br. Ind. vi. 314. Vern. *Sharānoi Kaunṭa*, Jaunsar.

An erect unarmed shrub. *Cladodes* 3-5 in. long, flat, falcate, acuminate. *Flowers* scarcely 1 in. diam., solitary or in pairs, white; pedicels 0-7 in., jointed above the middle, very slender. *Berries* 2-3 in. diam.

Common in JAUN SAR up to 9,000 ft., e.g., at Deoban.

The tuberous roots are pickled and are used in medicine. The shoots are eaten as a vegetable.

Fl. May, June.

2. ***A. racemosus***, Willd.; Fl. Br. Ind. vi. 316. Vern. *Satrāwal*, Dūn; *Sharānoi*, Jaunsar; *Jhīrnā*, Garhwal; *Sat-mūli*, *Hazār mūli*, Hind.

A much-branched shrub, at length climbing; branches triquetrous; spines 2-6 in. *Cladodes* 1 in. long, 2-6 together, channelled beneath. *Racemes* 1-3 in. long; pedicels 2 in. *Flowers* 1-2 in. diam., white. *Berries* 25 in. diam.

Throughout the SCHOOL CIRCLE, ascending to 5,000 ft. in JAUN SAR, e.g., Binālgādh, Dhārāgādh, etc.

The tuberous roots have the same use as those of *A. filicinus*.

Fl. Oct., Nov. Fr. Cold season.

Urginea indica, Kunth; Fl. Br. Ind. vi. 347; Vern. *Kāndā*, *Suhāranpur*; -- is a small herbaceous plant with long linear leaves, and



1. Phoenix, Linn.; G. P. n. 80.

Low or tall palms. *Leaves* pinnate; leaflets sessile, linear, entire, rigid, folded, obliquely attached to the rachis, the lowest transformed into strong spines; petiole inarticulate, persistent, with a fibrous amplexicaul sheath. *Flowers* dioecious, sessile; male in compact, female in interrupted, compound spikes; peduncle axillary, compressed. **MALE FL.:** *Calyx* cup-shaped, 3-toothed. *Petals* 3, valvate. *Stamens* usually 6. **FEMALE FL.:** *Calyx* of the male, accrescent in fruit. *Petals* 3, imbricate; staminodes 6. *Carpels* 3, free; stigmas sessile. *Fruit* an oblong 1-seeded drupe. *Seed* ventrally grooved; embryo dorsal; albumen even.

Analysis of the Species.

Stem bulbiform; fruiting peduncle very short. 1. *P. acaulis*.
Stem at length elongate; fruiting peduncle very long. 2. *P. humilis*.

1. ***P. acaulis***, Buch.; Fl. Br. Ind. vi. 426; Brandis For. Flora 555; Gamble Man. Ind. Timb. 419. Vern. *Khajúr*, *Khajúri*, Hind.

Stem like a bulb, never free above the ground. *Leaves* 2-5 ft. long; rachis laterally compressed; leaflets 9-18 in. long, 5-7 in. broad, very strongly nerved, thick, folded at first, opening out when mature; base raised on the side of the rachis and decurrent with it. *Spadix* 6-10 in. long, compressed; branches stout; peduncle of fruiting spadix flat, 6-8 in. long, but generally concealed in the sheaths of the petioles. *Fruit* seated on the spikelets at a narrow vertical angle, 5-7 in. long, ovoid-oblong, with a pinkish tip when young, blackish when ripe.

Common in the DÚN and SAHÁRANPUR FORESTS, generally in grass-lands, e.g., Bám Block, Pathri forest, Doiwála, Jhabráwála, Jehrá Block, Bidhálna Block, etc.

The leaves are plaited into a coarse matting, and make excellent brooms for use on fire-traces. The fruit is eaten.

Fl. Dec., Jan. Fr. Apr., May.

2. ***P. humilis***, Royle; Fl. Br. Ind. vi. 426. Vern. *Khujúr*, Hind.

A low palm with a slender stem 6-8 ft. high. *Leaves* 3-8 ft. long; rachis laterally compressed; leaflets 12-18 in. long, thin, smooth faintly nerved, always folded, generally scattered, sometimes in

opposite pairs; base only slightly raised on the side of the rachis, or not at all raised. *Male spadix* 1 ft. long; *female* somewhat shorter (excluding the peduncle); spikes often paniculately subdivided; peduncles flat, of fruiting spadix 2-2.5 ft. long, .5-8 in. broad. *Fruit* rather horizontal, .5-7 in. long, ovoid, generally mucronate, red when ripe.

SAHĀRANPUR SIWALIKS, especially towards the top, but common and of considerable size near Rānipur. It also occurs in the Chīr forests of TEHRI-GARHWAL, e.g., in the Lūnāgādh and Khūnīgādh Blocks.

Economic uses as of *P. acaulis*.

Fl. Dec., Jan. Fr. Apr.-June.

P. sylvestris, Roxb.; Fl. Br. Ind. vi. 425; Brandis For. Flora 554; Gamble Man. Ind. Timb. 419—The Wild Date Palm—Vern. *Khajūr*,—is cultivated in the DŪN, and also in the SAHĀRANPUR DISTRICT. It is often 30-40 ft. high, with a crown 12-15 ft. in diam. *Fruiting peduncle* 2-2.5 ft. by 1-1.5 in. with a large bunch of spikes. *Fruit* 1-1.2 in. long, yellow while ripening, reddish-brown when fully ripe. *Seeds* furrowed to the centre. In Bengal and in most parts of Madras a sugary sap is extracted from the tree by cuts made near the head. The leaves are made into mats, and the fruit is eaten.

2. Calamus, Linn.; G. P. n. 102.

1. **C. tenuis**, Roxb.; Fl. Br. Ind. vi. 447; Vern. *Bet*, *Bent*, Hind.

A climbing palm, growing in clumps from underground rhizomes; the upper part covered with sheaths of leaves. *Leaves* pinnate, 1.5-2.5 ft. long. *Leaflets* many, equidistant, gradually smaller towards the top, 4-12 by .3-.5 in., linear-lanceolate, acuminate, 3-nerved, the nerves and margins with bristles or prickles; petiole with straight spines; rachis with one row of short recurved conical prickles; sheath with adpressed flat spines and with a whip-like long thong armed with recurved prickles. *Spadices* axillary, decomposed, of various sizes according to position; spathes tubular, lower 6-10 in. long, armed with recurved prickles, upper scurfy. *Flowers* small, in pairs, male in scorpioid spikelets, female pedicellate and somewhat accrescent in fruit, both on the same spike. *Calyx* campanulate, 3-toothed. *Petals* 6, valvate. *Stamens* 6. *Ovary* 3-celled. *Fruit* .5 in. long, elliptic, clothed with closely-imbricating adpressed reflexed scales with dark-brown margins. *Seeds* ovoid-oblong, .3 in. long.

Marshy places in the DŪN, e.g., Gāngbhewā, Mothronwāla, Gularghāti, Nakraunda, Jogiwāla, Khairi, etc.



The cane is locally used for various purposes, chiefly for chairs and morahs. It is, however, inferior in quality to the canes used for the same purposes in Bengal, Assam and Burma, as it becomes brittle very soon, and is not so durable. The leaves are eaten by buffaloes, and the seeds are strung up in rosaries worn by fakirs.

Fl. July, Aug. Fr. Cold season.

ORDER 81. TYPHACEÆ; G. P. N. 190.

Perennial aquatic herbs. *Leaves* linear, thick, spongy. *Flowers* monœcious, very small, densely crowded in cylindrical or globose spikes, male above the female flowers. *Perianth* 0, or reduced to green scales or hairs. *Stamens* 1 or more. *Ovary* superior, 1-2-celled; styles persistent; stigmas laterally papillose. *Fruit* minute.

A small unimportant Family, of which only two species are briefly noticed:—

1. *Typha elephantina*, Roxb.; Fl. Pr. Ind. vi. 489. Vern. *Paterá*, Saháranpur.—*Leaves* radical, bayonet-shaped, 6-10 ft. long, triquetrous; margins often undulate above the middle. *Female spike* about 1.5 in. diam., brownish-orange, at the end of a long scape. The leaves are made into mats, and are also used for temporary walls. The pollen is said to be made into cakes and eaten. Found in the Pathri Block of the SAHÁRANPUR DIVISION, where it is rather an important article of minor forest produce. It is also found in swamps in the Dén.—G. P. n. 1.

2. *T. Laxmanni*, Lepech.; Fl. Br. Ind. vi. 489,—is a dwarfed species, 2-3 ft. high, found along the edges of marshes in the Dén, and in the Mantárgádh (4,500 ft.) in TEHRI-GARHWAL. *Male spikes* 1-2 in., *fem.* 6-1 in. long. Fl. Feb.-Apr.

ORDER 82. AROIDEÆ; G. P. N. 191.

Perennial herbs, sometimes scandent. *Leaves* alternate, generally net-veined. *Flowers* usually 1-sexual and monœcious, the male above the female, sessile, in fleshy spikes which are more or less enclosed in a green or coloured spathe, and often tailed. *Perianth* 0, or of



minute scales. *Anthers* 2-4-celled. *Ovary* sessile, 1-3-celled; stigma discoid or lobed. *Fruit* a berry, free or confluent.

Of this herbaceous Family only one forest plant appears deserving of mention:—

Scindapsus officinalis, Schott; Fl. Br. Ind. vi. 541. Vern. *Poria-hel*, Dún.—A fleshy climbing shrub, stem reaching 1 or more inches in diam., annulate. *Leaves* 5-12 by 2.5-6 in., ovate or elliptic-ovate, caudate-acuminate; base rather obliquely rounded or subcordate; petiole 3-6 in. long, elbowed at the tip, sheathing, amplexicaul. *Spathe* yellow within. *Berries* fleshy, ovoid or lanceolate, about 6 in. long. It is found in the Sál forests of the DÚN and SAHÁRANPUR DIVISIONS, trailing on trees by means of suckers from the nodes. Very common in the Dúdhli Block. The stem is traversed by a strong fibre which is easily separated and can be used for various purposes. The berries are used in native medicine, and the leaves as a vegetable.—G. P. n. 78.

Many plants of this Family are cultivated, chiefly for their starchy tubers, of which *Colocasia Antiquorum*, Schott; Fl. Br. Ind. vi. 523; Vern. *Ghuiná*, is well known in the SCHOOL CIRCLE, and is cultivated throughout the PLAINS and the DÚN and also in JAUNSAH up to 6,000 ft., as an important food-plant.—G. P. n. 80.

GLUMIFERÆ.

ORDER 83. CYPERACEÆ; G. P. N. 199.

Grass-like herbs; stems solid, generally triquetrous. *Leaves* 3-ranked; sheaths not split. *Flowers* minute, solitary, subtended by a single glume, in spikes which are variously arranged. *Perianth* 0, or reduced to bristles or scales. *Stamens* 1-3; anthers basifixed. *Ovary* 1-celled; style 2-3-cleft, branches stigmatose. *Fruit* a compressed or 3-gonous nut.

Numerous plants of the Family are found in the SCHOOL CIRCLE, some of which are useful as fodder or for other purposes, but they are beyond the scope of this book. One, however, deserves mention, being noted for its strong fibre:—

Eriophorum comosum, Wall.; Fl. Br. Ind. vi. 664.—*Stem* 6-20 in., slender, tough. *Leaves* serrulate, harsh, overtopping the



83. CYPERACEÆ.

[*Eriophorum*.]

stems. *Umbels* 2-8 in. diam. *Bracts* 8-12 in. *Glumes* dark-brown, glossy. *Nuts* 3-gonous, beaked, smooth. Common in the SCHOOL CIRCLE, and put to much the same uses as the *Bhábar* grass, *Ischaemum angustifolium*, Hack.—G. P. n. 12.

ORDER 84. GRAMINEÆ; G. P. N. 200.

Herbs, shrubs, or trees; stem jointed; internodes generally hollow. *Leaves* alternate, simple, entire, closely parallel-nerved; base sheathing, distinct from the blade; sheath split in front to the base, often with a ligule at the apex, sometimes constricted into a petiole and jointed to the blade. *Flowers* usually 2-sexual, in variously arranged spikelets. *Spikelets* with 1-3 empty glumes at the base. *Flowering glumes* distichous, each with a 2-nerved scale at its axil which is called the *palea*. Between the *palea* and the flowering glume is the true flower consisting of 2 or 3 minute ciliate scales (*lodicules*), and stamens or a pistil, or both. *Stamens* usually 3, rarely 6 or more, hypogynous; anthers versatile. *Ovary* 1-celled; styles 2 or 3, clothed with stigmatose hairs. *Fruit* a 1-seeded caryopsis; embryo erect or oblique, at the base of the grain, with copious mealy albumen.

TRIBE I. BAMBUSEÆ.

The Bamboos.

This Tribe is distinguished from other Tribes chiefly by comprising all shrubby and tree-like grasses, commonly known as Bamboos,—by the blade of the leaf being petiolate and articulated to the sheath which is variously auricled,—and by being protected while young by a second form of sheath which usually produces no true leaf. The flowers, moreover, have generally 6 or more stamens, while those of other grasses have only 3.



84. GRAMINEÆ.

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Analysis of the Genera.

- Stamens 3, pericarp adnate to the seed. Small bamboos 1. ARUNDINARIA.
Stamens 6. Generally large bamboos.
Pericarp adnate to the seed 2. BAMBUSA.
Pericarp separable from the seed 3. DENDROCALAMUS.

1. *Arundinaria*, Michx.; G. P. n. 277.

Small bamboos. Culms slender, rarely over 1 in. in diameter, hollow; branches short and fascicled at the nodes. Culm-sheaths papery; blade narrow, subulate. Leaves usually small, often with transverse veinlets. Inflorescence paniculate or racemose. Spikelets 1-many-flowered, usually 2-sexual. Empty glumes 2, unequal, membranous. Flowering glumes longer, many-nerved. Palea 2-keeled. Lodicules 3, ciliate. Stamens usually 3. Ovary globose above; style 2-3-plumose. Grain dorsally furrowed, included in the persistent flowering glume and palea.

Analysis of the Species.

- Rootstock caespitose; culms crowded.
Leaves without transverse veinlets. 1. *A. falcata*.
Leaves with conspicuous transverse veinlets. 2. *A. spathiflora*.
Rootstock long-creeping; culms distant 3. *A. jaunsarensis*.

1. *A. falcata*, Nees; Fl. Br. Ind. vii. 381; Brandis For. Flora 562; Gamble Bamb. Brit. Ind. 12, t. 11. Vern. *Go-Ningál* Jaunsar; *Ringál*, Hind.

A small bamboo. Culm 6-10 ft. high, .3-.6 in. diam., cylindrical, sometimes with a white bloom; nodes much swollen; internodes 6-12, in. long. Culm-sheaths scaberulous without, tapering to a truncate tip, 12 by 3 in.; margins ciliate; blade subulate, recurved; ligule toothed. Leaves 3-4 by .2-.5 in., with pellucid glands in rows between the nerves; sheath glabrous. Flowers in panicles, on separate leafless stems. Spikelets .5-.7 in., distant or 3-4 together.

Common between 4,000 and 7,500 ft. in JAUNSAAR and TEHRI-GARHWAL; more or less gregarious: Korwá, Chakrata, Mautárgádh etc.



2. **A. spathiflora**, Trin.; Fl. Br. Ind. vii. 382; Gamble Bamb. Brit. Ind. 17, t. 16. Syn.—*Thamnocalamus spathiflorus* Munro; Brandis For. Flora 563. Vern. *Deo-Ningál*, Jaunsar; *Ringál*, Hind.

Culm 12-20 ft. high, .5-1 in. diam., smooth, glaucous-green when young; nodes prominent; internodes 6-15 in. long. *Culm-sheaths* loose, glabrous, margins ciliate; blade 2-4 in. long, subulate, erect; ligule fimbriate. *Leaves* 3-5 by .4-.6 in., linear-lanceolate; margins scabrous; petiole .1-.2 in.; main nerves joined by numerous transverse veins; sheath 2-3 in. long, truncate; auricles bristly; ligule long-ciliate. *Flowers* in paniculate racemes. *Spikelets* 1-2.5 in. long, pedicelled, 2-3 together in a narrow spathe-like yellow sheath—whence the specific name.

Common in JAUNSAAR and TEHRI-GARHWAL, 7,500-9,000 ft., generally above the zone of *A. falcata*; eminently gregarious in habit. It flowered gregariously in JAUNSAAR in 1882.

3. **A. jaunsarensis**, Gamble Bamb. Brit. Ind. 23, t. 22; Fl. Br. Ind. vii. 384. Vern. *Ningál* or *Ringál*, JAUNSAAR.

This handsome little bamboo is easily recognised from *A. spathiflora*, upon whose zone it encroaches, by its single culms arising from a long creeping jointed rhizome. *Culm* 10-15 ft. long, .5 in. diam., nodes marked by a narrow ring, internodes 9-11 in. long. *Culm-sheath* yellow, glabrous, narrowed to a truncate 2-auricled bristly tip. *Leaves* 4-6 in. long, lanceolate, acuminate, with numerous transverse veins between the nerves. *Flowers* and *spikelets* not seen yet.

I happened to be with Mr. Gamble when he made the discovery of this species in the Tátuagádh, Mundáli, in May 1891. It is curious that it has not yet been found in any other locality in JAUNSAAR.

It is quite possible that *A. Falconeri*, Benth. & Hook. f.; Fl. Br. Ind. vii. 383,—is also found in the SCHOOL CIRCLE. It closely resembles *A. spathiflora*, but the leaves have no transverse veins, and the spathe-like sheaths are much smaller.

These small bamboos are used for fishing rods, hooka-pipes, and locally for baskets and similar other purposes. They flower at intervals of about 30 years.

2. *Bambusa*, Schreb.; G. P. n. 286.

Large bamboos, usually growing in clumps. *Culm-sheaths* broad; blade often triangular. *Leaves* linear or oblong-lanceolate, acuminate, shortly petioled. *Inflorescence* usually a large leafless panicle bearing heads of

spikelets. *Spikelets* 1-many-flowered. *Empty glumes* 1-4. *Flowering glumes* ovate, lanceolate, mucronate. *Palea* 2-keeled. *Lodicules* 3, membranous, ciliate. *Stamens* 6. *Ovary* oblong or obovate; stigmas 2-3. *Grain* furrowed on one side; pericarp thin, adherent.

Analysis of the Species

- Culms distant, unarmed; nodes not much raised;
leaves and spikelets long 1. *B. nutans*.
Culms crowded, armed; nodes prominently
raised; leaves and spikelets short 2. *B. arundinacea*.

1. ***B. nutans***, Wall.; Fl. Br. Ind. vii. 387; Brandis For. Flora 567; Gamble Bamb. Brit. Ind. 32, t. 30. Vern. *Bāns*, Hind., which is the common name for all large bamboos.

Culms rising from a creeping rhizome, not crowded, 20-40 ft. high, 1.5-3 in. diam., straight, gracefully nodding; nodes not much raised, often hairy; internodes 15-18 in. long, thick-walled, not shining. *Culms-sheaths* 6-9 in. long, top rounded, with adpressed black hairs on the back; blade varying in size according to position in the culm, acute, margins recurved, black-hairy within, with 2 large wavy densely-bristly auricles; ligule narrow, dentate. *Leaves* 6-12 by 1-1.5 in., bristly auricles; ligule narrow, dentate. *Leaves* 6-12 by 1-1.5 in., twisted; base rounded or narrowed; petiole 1-2 in.; sheath striate, produced into a falcate auricle which is crowned with long bristles. *Inflorescence* a stiff panicle of spikelike branches which bear interrupted clusters of spikelets. *Spikelets* 7-1 in. long, glabrous, acute, many empty or with buds inside; axis (*rachillum*) clavate. *Lodicules* 3, imbricate. *Anthers* apiculate. *Stigmas* 2-3, twisted. *Grain* oblong, hairy on the top.

Cultivated in the Dûr, also in low valleys in JAUNSAH, about villages and in sacred groves; also in gardens for ornament: Barkôt, Káluwāla; Āmlāwā valley, etc.

Straight, thick-walled and never crowded, it is a very useful bamboo for use as rafters, and as shafts of dog-carts and *ekkas*.

Flowers at intervals of about 55 years.

2. ***B. arundinacea***, Willd.; Fl. Br. Ind. vii. 395; Brandis For. Flora 564; Gamble Bamb. Brit. Ind. 51, t. 48. Vern. *Kāntā-Bāns*, Hind.

A tall thorny bamboo with crowded culms rising from branching rootstocks. *Culms* bright-green, shining, varying in size, the largest



80-100 ft. high, 6-7 in. diam.; nodes prominent, lower with almost leafless spinescent more or less zigzag horizontal branches; internodes up to 18 in. long, somewhat depressed near the base of the branches, thick-walled; cavity small. *Culm sheaths* 12-15 by 9-12 in., together with the blade triangular when flattened out, thickly covered with golden hairs when young; blade 2-4 in. long, triangular, acuminate, glabrous without, matted with dark bristles within; margins wavy, involute, thickly ciliate, auriculate; ligule narrow. *Leaves* 8 by 1 in., often much smaller, linear or linear-lanceolate, glabrous above, glabrate beneath; margins scabrous; tip sharp, stiff; main nerves 4-6, with pellucid glands at intervals; base rounded, often somewhat oblique, ciliate near the petiole; petiole 1 in., often swollen; sheath with short auricles, thickly ciliate when young. *Inflorescence* an enormous panicle, often comprising the whole culm. *Spikelets* about 5 in a cluster, 5-7 in. long, lanceolate, acute, bearing a few male flowers above the 2-sexual ones. *Lodicules* 3, small, fimbriate. *Stamens* slender, drooping; anthers obtuse. *Grain* ending in a short beak formed by the base of the style.

Cultivated in the DEHRA DŪN and SAHÁRANPUR DISTRICTS :
Ājabpur, Mothronwāla, etc.

Its great strength and superior size make it eminently fit for all building purposes, but owing to the thorns and the crowded condition of the clumps, it is extremely difficult to pull the bamboos out except in very small bits.

Appears to flower gregariously at intervals of 30-40 years.

3. *Dendrocalamus*, Nees ; G. P. n. 289.

Unarmed bamboos, often of very large size. *Culm-sheaths* usually elongate; blade narrowly triangular. *Leaves* short-petioled, often with pellucid glands, *Spikelets* few-flowered, in congested globose clusters, on the long branches of a compound panicle. *Flowers* usually 2-sexual. *Empty glumes* 2-3, ovate, acute or mucronate. *Flowering glume* like the empty glumes. *Palea* of lower flowers 2-keeled, ciliate,—of the uppermost flowers rounded on the back and not ciliate. *Lodicules* usually none. *Stamens* 6. *Ovary* hairy above; style long; stigma simple. *Grain* small, surrounded by a crustaceous pericarp.

*Analysis of the Species.*

- A middle-sized bamboo. Spikelets spinescent,
lanceolate, green, not depressed. 1. *D. strictus*.
A large bamboo. Spikelets soft, ovoid, purple,
depressed. 2. *D. Hamiltonii*.

1. ***D. strictus***, Nees; Fl. Br. Ind. vii. 404; Brandis For. Flora 569; Gamble Bamb. Brit. Ind. 78, t. 68, 69. The Male Bamboo. Vern. *Bāns*, Hind.

A densely tufted gregarious bamboo, deciduous in dry climates or in years of drought. Culms variable in size according to climate from 20 to 50 ft. in height, and 1 to 3 in. in diameter, dark-green, with a white waxy bloom when young, yellowish when old, peculiarly crooked and twisted in congested clumps; nodes somewhat swollen, lower often rooting; internodes 10-15 in. long, solid or with a small cavity. Culm-sheaths variable in size, 3-12 in. long, paraboloidal, glabrous or with yellowish-brown hairs on the back; top rounded, ciliate, slightly auricled; blade triangular, hairy, especially within; ligule narrow. Leaves very variable in size, between 10 by 1-2 in. and 1 by 2 in., generally about 6 in. long, linear-lanceolate, rough and more or less hairy on both surfaces, scabrous on the edges; midrib prominent, lateral nerves 3-6 pairs; base abruptly rounded; tip twisted; petiole 1-2 in.; sheath hairy at first, terminating in a prominent callus; auricle short, ciliate; ligule narrow, serrate. Panicle large; clusters of spikelets 1-1.5 in. diam., 1-2 in. apart. Spikelets 3-5 in. long, 1-2 in. diam., usually hairy outside, with 2-3 fertile and many sterile flowers; glumes all spinescent. Palea emarginate. Stamens long-exserted; filaments fine; anthers 2-3 in. long. Grain ovoid, beaked, hairy above.

Indigenous and gregarious in the DEHRA DŪN and SAHĀRANPUR SIWĀLIKs, especially towards Hardwar; cultivated in the DŪN.

In North-West India this is the only bamboo that is found wild in any quantity and is therefore used for a variety of purposes. It is strong and durable and, but for its small size, would easily be the best bamboo in India. It supplies many industries, e.g. basket-making at Hardwar, and the manufacture of furniture at Bareilly.

A few clumps in a forest, or a few culms in a clump here and there, flower every year; but at the interval of a certain number of years it flowers gregariously over large areas. One such gregarious seeding took place at Rānīpur in 1884.

Fl. Nov.-Apr. Fr. June.

2. ***D. Hamiltonii***, Nees & Arn.; Fl. Br. Ind. vii. 405; Brandis For. Flora 570; Gamble Bamb. Brit. Ind. 84, t. 74. Vern. *Kāghzi-Bāns*, Hind.



An ugly-looking bamboo with stems slanting on all sides or curved downwards. Culms up to 80 ft. in height and 4-7 in. diam., with long stout branches above, adpressedly densely white-pubescent when young, dull-green when old; nodes marked with root-scars; internodes 12-20 in. long; walls .5 in. thick. Stem-sheaths glabrous or with patches of adpressed hairs; auricles acute; blade lanceolate, with incurved margins; ligule .2 in., smooth, entire. Leaves variable, up to 15 by 2.5 in., broadly lanceolate, cuspidate, smooth above, rough beneath, minutely serrulate at the edges; main lateral nerves 6-17 pairs, secondary nerves with pellucid glands between; base often unequal-sided, rounded; petiole short; sheath glabrous within, with adpressed white hairs without, slightly keeled below the callus; ligule broad. Panicle very large, branches furrowed on one side; clusters of spikelets .5-1.5 in. diameter, .5-1 in. apart, supported by scarious bracts. Spikelets .4 in. long, ovoid, depressed, purple, glabrous; glumes membranous; flowers 2-4, all fertile. Stamens exserted pendulous; anthers purple, with a hairy tip. Grain broadly ovoid, beaked.

Cultivated in the DŪN, and about villages in the MUSSOORIE and JAUNSAH HILLS. It seems to thrive well.

Being thin-walled and rather soft, it is not very good for building purposes, but is much used for basket-and mat-work. The young shoots are eaten as a vegetable. The GĀROS cook rice in the hollow internodes which they place over fire in a slanting position, and keep turning at short intervals until the outside is all charred; then they split the bamboo open to take out the rice.

It flowers both annually and gregariously like *D. strictus*.

Besides the cultivated cereal crops which supply the staple food of man throughout the world, there are hundreds of grasses of great forest interest, some yielding fibre and paperstock, others supplying forest industries, others again useful as soil-binders, while a great many are indispensable for fodder. But they are obviously beyond the scope of this little Flora. Only a few are mentioned below:—

1. *Thysanolaena Agrostis*, Nees; Fl. Br. Ind. vii. 61. Vern. Pirlū, DŪn and Sahāranpur. The Broom-grass. This is a tall grass up to 12 ft. high, with a dense bushy fox-tail-like terminal panicle. Spikelets very minute, sometimes viviparous. The large broad leaves somewhat resemble those of bamboos. It is often used for brooms, and

The stems furnish the reed-pens used in vernacular writing. Deep
ravines and shady places up to 5,000 ft.—*G. P. n. 58.*

2. *Saccharum arundinaceum*, Retz.; Fl. Br. Ind. vii. 119; Vern. *Munj*, *Sarwár*, Hind.—A tall grass up to 20 ft. high, with a much-branched grey or greyish-brown silky panicle, and a glabrous stem. In the SAHÁRANPUR DIVISION the stem which is used for chiks, morahs, etc., is called *bínd*; the flowering scape which is used for winnowing trays and for light covers over carts (*sirke*) is called *tílú*; and the sheath next to the scape which is twisted into cordage and from which a neat durable matting is made, is called the *munj* proper, after which the grass has been named. Common along ráus and the foot of the HILLS in the SAHÁRANPUR DIVISION.—G. P. n. 75.

3. *Ischæmum angustifolium*, Hack.; Fl. Br. Ind. vii. 129; Vern. *Bhābar*, Sahāranpur; *Bāib*, *Bābai*, Hind.—Perhaps the most important of all forest grasses. Stems 3-5 ft. long, wiry, woolly at the base; leaves about 1 in. broad, convolute, very fibrous. Spikes simple or compound, 1-2 in. long, golden- or rusty-villous. In the SCHOOL CIRCLE the grass is made into ropes which are used for various purposes. It is in great demand for paper-making at Lucknow and Calcutta. Common in the SAHĀRANPUR SĪWALIKS.—G. P. n. 91.

4. *Andropogon Schœnanthus*, Linn.; Fl. Br. Ind. vii. 204; Vern. *Mirchá-gandh*, Saháranpur.—A handsome grass 3-6 ft. high. Spikes inside a reddish brown spathe. Base of leaf-blade rounded or cordate and amplexicaul. When the stems are cut away, the rootstocks get covered with curly posthumous leaves. It is the famous Rusa-grass from which an aromatic oil is extracted. The roots are used in medicine, and the rootstock is largely purchased by a certain class of pilgrims at Hardwar, probably as a souvenir for friends at home. Common in the plains portion of the Ránipur Range, SAHÁRANPUR DIVISION.—*G. P. n. 94.*

5. *Andropogon Nardus*, Linn.; Fl. Br. Ind. vii. 205.—An aromatic grass much resembling *A. Schoenanthus*, but the leaves are not rounded and amplexicaul at the base, and the spathes much smaller. Also it has a somewhat different habitat, being found in the DŪN, and also in JAUNSAK up to 7,500 ft. (No. 25006 of Mr. Gamble's collection, Mátkángrá, JaunsaK) as well as in the SAHÁRANPUR SIWÁLIK.

6. *Anthistiria gigantea*, Cav.; Fl. Br. Ind. vii. 216; Vern. *Dhālā-ghās*. Dún; *Kumria*, Garhwal. The Spear-grass.—A tall grass 8-16 ft. high, with a hard solid compound stem, notorious for its long-awned dark-brown hairy seed which readily get into clothes and are not easily got rid of. Common in the DÚN and SAHÁRANPUR DIVISIONS, especially in coppice areas and blanks.—*G. P. n. 97*.

7. *Arundo Donax*, Linn.; Fl. Br. Ind. vii. 302. Vern. *Nal*, Hind.—A tall reed with hollow stems. *Leaves* tapering from an



84. GRAMINEÆ

CSL
[*Phragmites*.]

amplexicaul base. Axis of spikelets (*rachillum*) elongate, glabrous; flowering glume silky-hairy. *Panicle* thyrsiform. Found along streams and in shady ravines in the DŪN and SAHĀRANPUR DIVISIONS.—*G. P. n.* 211.

8. *Phragmites communis*, Trin.; Fl. Br. Ind. vii. 303. Vern. *Nal*, Hind. This is a hollow reed found above 3,000 ft. in the hills. *e.g.*, Thadiar and other places in GABHWAL. It is used for a kind of coarse matting.—*G. P. n.* 21

9. *Phragmites Karka*, Trin.; Fl. Br. Ind. vii. 304. Vern. *Nal*, Hind. This reed is a native of the plains of India and is found at Pathri near Hardwar and such other water-logged localities. The stems are of a larger size but softer-walled than those of *P. communis*, and make a neater kind of matting.

The Genus *Phragmites* differs from *Arundo* by the leaves not being amplexicaul at the base, by short silky rachilla, and by glabrous flowering glumes.

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* * The letters affixed to names denote the localities or languages to which they belong. Thus *B.* stands for Bengal; *D.* for Dehra Dún; *E.* for English or European, also for Eastern; *G.* for Garhwal; *H.* for Hindi or Hindustani; *J.* for Jaunsar; *K.* for Kumaun; *Ka.* for Kálsi; *Ma.* for Málköt; *Mu.* for Mussoorie; *N.-W.* *P.* for the North-West Provinces; *P.* for the Punjab; *R.* for Rajpur; *S.* for Saháranpur; *Sans.* for Sanskrit; *T. V.* for Tons Valley, and *W.* for Western.

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Common in the DÚN and SAHÁRANPUR FORESTS, especially in shady ravines: Rámgarh, Karwápáni, Bádsháhibágh, Dholkhand, etc.

Wood greyish-brown, close- and even-grained, durable, is not attacked by insects; heartwood not distinct; weight 46 lbs. per c. ft. "A fine wood worth notice."—*Mr. J. S. Gamble*. The inner bark, which is granular and viscid, is used as an external application for sprains and bruises.

Fl. Rainy season. Fr. Nov., Dec.

2. **L. polyantha**, Juss.; Fl. Br. Ind. v. 162. Syn.—*Tetranthera monopetala*, Roxb.; Brandis For. Flora 380; Gamble Man. Ind. Timb. 310. Vern. *Karkáwa* or *Karká*, Dún.

A moderate-sized evergreen tree with dark-grey smooth bark. *Leaves* 4-8 in. long, oblong ovate or obovate, tip acute or rounded, glabrous above, rusty-tomentose and strongly reticulate beneath; lateral nerves 5-10 pairs; petiole .5-1 in. *Umbels* stoutly pedicelled, 5-6 flowered; bracts 5, membranous. *Stamens* 9-13; filaments hairy. *Fruit* ovoid; .2-3 in. long, on a small perianth-base.

Very common in scrub forests in the DEHRA DÚN and SAHÁRANPUR DISTRICTS, and in low valleys in the HILLS.

Wood of a dark-grey colour, not durable; weight 38 lbs. per c. ft. The bark is used in native medicine, and the leaves to feed cattle, and the Mugá silkworms in Assam.

Fl. Mar., Apr. and also irregularly throughout the year. Fr. four months after flowering.

3. **L. elongata**, Wall.; Fl. Br. Ind. v. 165.

A small tree with stout branches; branchlets rusty-tomentose. *Leaves* alternate, very variable, generally 4-5 by 1-1.5, but occasionally much longer and broader, oblong or elliptic-lanceolate, obtuse, acute or acuminate, strongly reticulate and rusty-tomentose beneath; lateral nerves few or many; base generally acute; petiole stout, .3-5 in. long. *Umbels* 4-5-flowered, very rarely clustered; male larger than female; pedicels of varying lengths; flowers woolly. *Sepals* 4-6, obtuse. *Stamens* 8-12; filaments slender, villous. *Ovary* glabrous, rudimentary in the male fls.; style stout; stigma discoid. *Fruit* .5 in. long, oblong, seated on a perianth-base which is .3 in. diam.

Shady ravines in the OUTER HIMALAYA, - along the 'Mall' at Mussoorie (*Mr. J. S. Gamble*), Sansáru Khálá in Málkót, etc. Rather rare.

Fl. Mar., Apr. Fr. June, July.

4. **L. lanuginosa**, Nees; Fl. Br. Ind. v. 178; Brandis For. Flora 382; Gamble Man. Ind. Timb. 312.

A moderate-sized tree with brown bark. *Leaves* crowded at the ends of the branches, 6-12 in. long, elliptic-lanceolate or oblanceolate,



65. LAURINEÆ.

CS
[Litsaa.]

acute or acuminate, very tough and coriaceous, silky-hairy when young, afterwards glabrous above, glaucous beneath, strongly sub-triplinerved at the base; petiole 3-8 in. long. *Bracts* villous. *Umbels* in 4-fid sessile clusters nearly 1 in. in diam. *Stamens* 6; glands of inner stamens long-stalked. *Fruit* 5 in. long, acute at both ends, seated at the thickened ends of the pedicels.

JAUNSAAR and TEHRI-GARHWAL, up to 6,000 ft.; not common: Bāmsu valley, 4,000 ft. Tons valley, 3,500 ft. Also in the Mothron-wāla swamp in the Dūn, 1,900 ft.

Wood yellow when fresh cut.

Fl. Feb., Mar. (?). Fr. Dec., Jan.

5. **L. umbrosa**, Nees; Fl. Br. Ind. v. 179. Syn.—*L. zeylanica*, Nees; Brandis For. Flora 382; Gamble Man. Ind. Timb. (including *L. consimilis*, Nees) 311. Vern. *Shūrūr*, Jaunsar.

A moderate-sized evergreen tree with a spreading crown and dark-brown bark. *Leaves* alternate, 3-6 in. long, oblong elliptic or oblong-lanceolate, acute or acuminate, thinly coriaceous, glabrous above, glaucous beneath, usually sub-triplinerved at the base; petiole 5-15 in. *Umbels* in small 4-5-fid sessile clusters, few-flowered. *Stamens* 6; glands sessile. *Fruit* 3 in. diam., globose or oblong, on slender pedicels which are 5 in. long.

Common in JAUNSAAR and TEHRI-GARHWAL, 4-7,000 ft., generally in shady forests or ravines.

Wood reddish-white, moderately hard; heartwood distinct with a darker colour; weight 36-38 lbs. per c. ft. Used for house-building in South India. An oil is extracted from the fruit, which is used for burning and is considered by the hill people as a specific for itches and other skin diseases.

Fl. Mar.-May. Fr. Sept., Oct.

ORDER 66. THYMELÆACEÆ; G. P. N. 145.

Small trees or shrubs. *Leaves* alternate or opposite, simple, entire, exstipulate. *Flowers* regular, usually 2-sexual; perianth tubular or campanulate; lobes 4-5, imbricate, sometimes with scales at the base. *Stamens* as many or twice as many as the perianth-lobes. *Ovary* superior, usually 1-celled; style short or long or 0; stigma capitate; ovule solitary, pendulous. *Fruit* indehiscent.

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2. **L. Scurrula**, Linn. ; Fl. Br. Ind. v. 208.

A very variable parasite with many distinct varieties. The following description refers to the variety found in the School Circle. *Leaves* 2-4 in., opposite, ovate-oblong or obovate, young on both surfaces and old beneath scurfy or grey-tomentose; base rounded or cordate; petiole .3-.6 in. *Flowers* .2-1 in., very slender, usually buff outside, in axillary fascicles or short racemes; buds terete, with an acute tip. *Calyx-limb* wholly truncate. *Corolla* slightly curved, .5-1 in. long; lobes 4, short. *Style* filiform, purple. *Fruit* .2-3 in., obconic.

Fairly common in the SIWALIK TRACTS.

Fl. Cold season.

Very closely allied to this is *L. cordifolius*, Wall.; Fl. Br. Ind. v. 209,—differing only in larger and more distinctly cordate leaves, and copious white tomentum; indeed some botanists suggest its being a variety of *L. Scurrula*. SUB-HIMALAYAN and SIWALIK TRACTS (?).

3. **L. pulverulentus**, Wall.; Fl. Br. Ind. v. 211; Brandis For. Flora 396; Gamble Man. Ind. Timb. 319. Vern. *Parand*, Kumaon; *Bándá*, Hind.

A stout woody parasite with dark-grey bark. *Leaves* opposite, 4-6 in. long, broadly ovate or ovate-oblong, coriaceous, thickly mealy-tomentose when young; base acute or rounded; petiole .5-.7 in. long. *Racemes* .5-2.5 in. long, axillary, solitary or fascicled. *Flowers* 1 in. long. *Pedicels* .2-.3 in. long, grey-scurfy outside. *Calyx-limb* 6. *Corolla* slender, tubular, curved; segments 4, linear, green. *Style* very slender. *Fruit* .3 in. long, turbinate, grey-tomentose.

A common parasite in the DÚN and SAHÁRANPUR FORESTS. Has been found on *Butea frondosa*, *Dalbergia Sissoo* and many other trees.

Fl. Sept.-May, and probably throughout the year.

4. **L. vestitus**, Wall.; Fl. Br. Ind. v. 212; Brandis For. Flora 396; Gamble Man. Ind. Timb. 320. Vern. *Pand*, Hind.

A robust woody parasite. *Leaves* opposite, 2-3 by .7-1.2 in., oblong, ovate or elliptic, glabrous, deep-green and shining above, densely ferruginous-tomentose beneath; margins recurved; base acute; petiole .2-.3 in. long. *Flowers* .5-.7 in. long, rusty outside, in few-flowered clusters. *Calyx* distinctly toothed. *Corolla* tubular, lobes very short, obtuse; buds with a globose apex. *Fruit* .3-.5 in. long, usually ovoid; seed imbedded in a viscid pulp.

Fairly common in JAUNSAAR and TEHRI-GARHWAL and generally found on Oaks, especially *Quercus incana*; e.g., at Kathián, where hardly any tree has escaped.

Fl. throughout the year, chiefly Oct.-Jan.



5. **L. longiflorus**, Desrouss.; Fl. Br. Ind. v. 214; Brandis For. Flora 397; Gamble Man. Ind. Timb. 320. Vern. *Bândâ*, Hind.

A large woody parasite, with handsome flowers. *Leaves* opposite or alternate, 3-10 by 5-5 in., very variable in shape, coriaceous, brittle when fresh, glabrous, young, usually pink; nerves very faint; petiole 3-7 in. *Flowers* 1.5-2.5 in. long, scarlet or orange, sometimes tipped with green, in axillary or supra-axillary unilateral racemes which are 1-4 in. long. *Calyx-limb* truncate or with short sharp points. *Corolla* tubular, curved, somewhat swollen near the middle, split halfway down at the back; segments 5, linear. *Ovary* cylindrical or urceolate, glabrous. *Fruit* 3-5 in. long, oblong, black when ripe.

Extremely common, and has been found on most trees in the DÚN and SAHÁRANPUR FORESTS, ascending to 7,500 ft. in JAUNSAAR and TEHRI-GARHWAL, where, however, the flowers are rather smaller and not quite so vividly coloured.

Fl. almost throughout the year but chiefly Nov.-June.

2. *Viscum*, Linn.; G. P. n. 3.

Parasitic shrubs with dicho- or trichotomous branches. *Leaves* opposite or wanting. *Flowers* unisexual, minute, solitary or fascicled in the axils of the leaves, or at the nodes of the branches. *Perianth-segments* 3-4, very thick, usually deciduous. *Anthers* sessile, epiphyllous, opening by many pores. *Stigma* sessile, large. *Fruit* succulent; embryos 1-2 in each seed in fleshy albumen.

Analysis of the Species.

- | | |
|--|----------------------------|
| Branches terete, leafy; flowers diœcious; berries white. | 1. <i>V. album</i> . |
| Branches flattened, leafless; flowers usually monœcious; berries pale-green or yellow. | |
| Internodes 1-2 in., striate or furrowed; perianth-lobes deciduous. | 2. <i>V. articulatum</i> . |
| Internodes 2-6 in., with only a middle line or none; perianth-lobes persistent. | 3. <i>V. japonicum</i> . |

1. **V. album**, Linn.; Fl. Br. Ind. v. 223; Brandis For. Flora 392; Gamble Man. Ind. Timb. 319. The Mistletoe. Vern. *Chûlá-ká Bândâ*, Jaunsar.

A large parasitic shrub, green all over; branches dichotomous or whorled. *Leaves* about 2 by 4 in., sessile, cuneate-oblong or

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